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January 18, 1930

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ELECTRICAL WORLD

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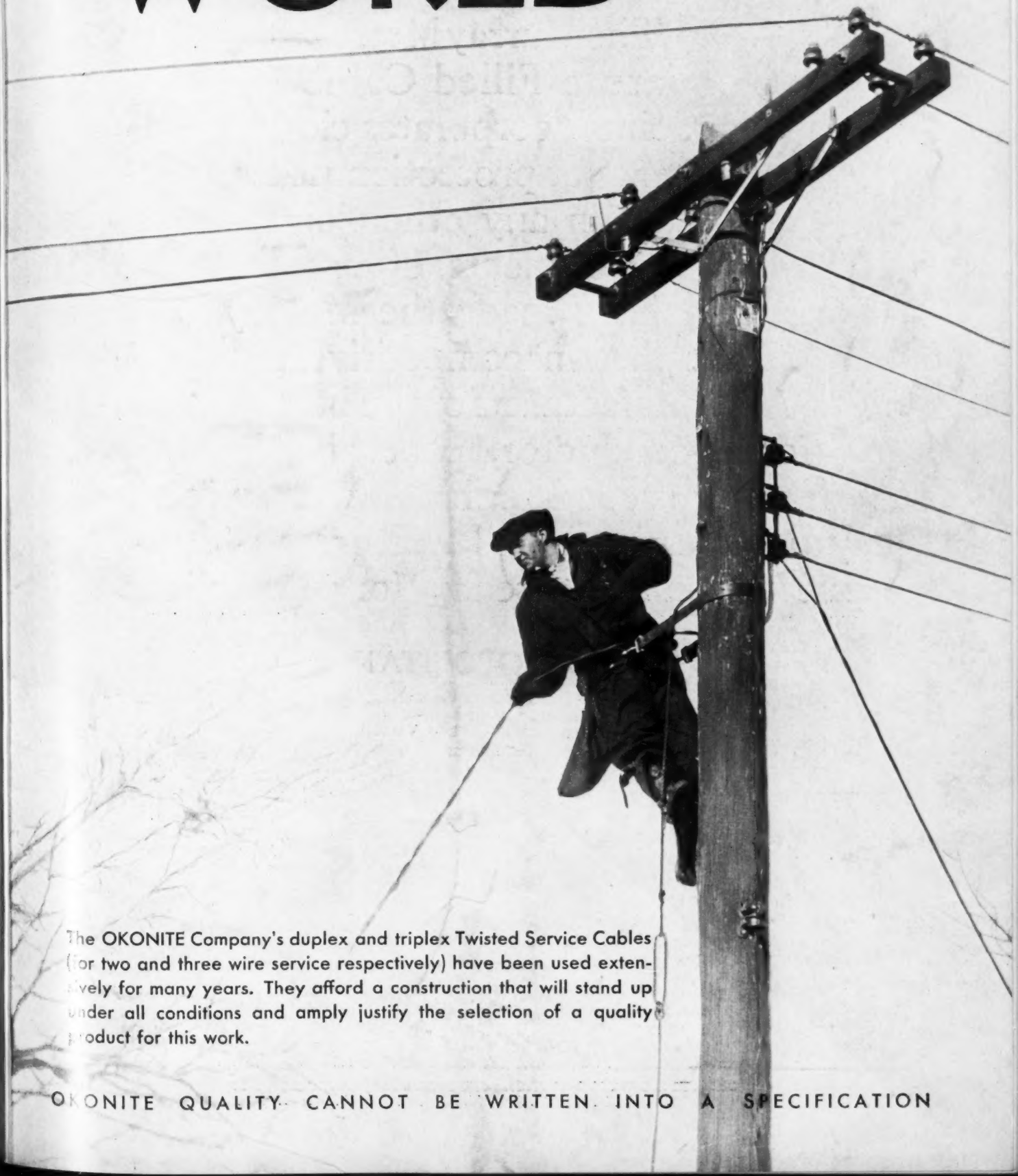

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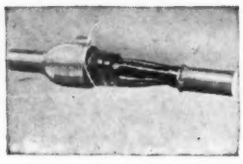

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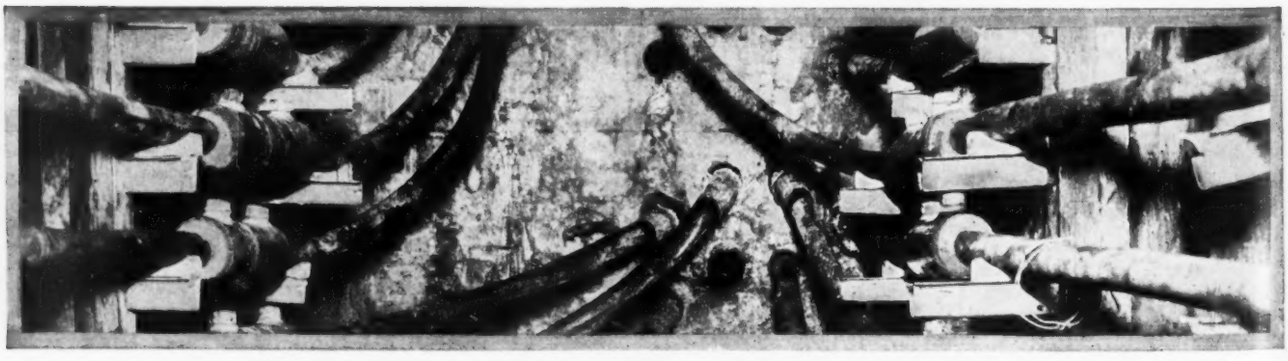

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ELECTRICAL WORLD

A consolidation of Electrical World, Electrical Engineer and American Electrician

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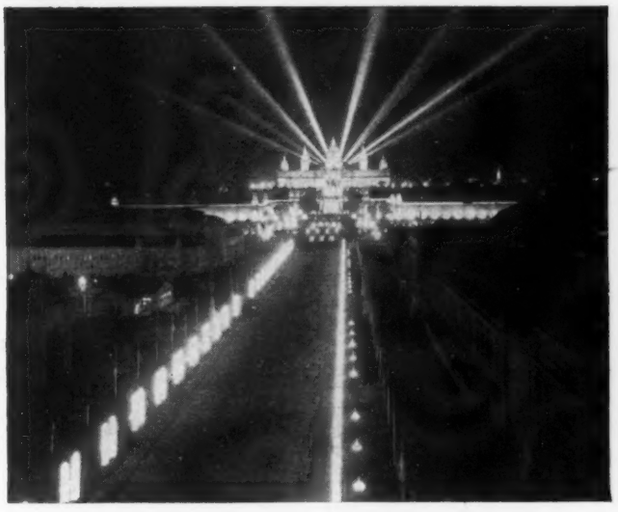

January 18, 1930

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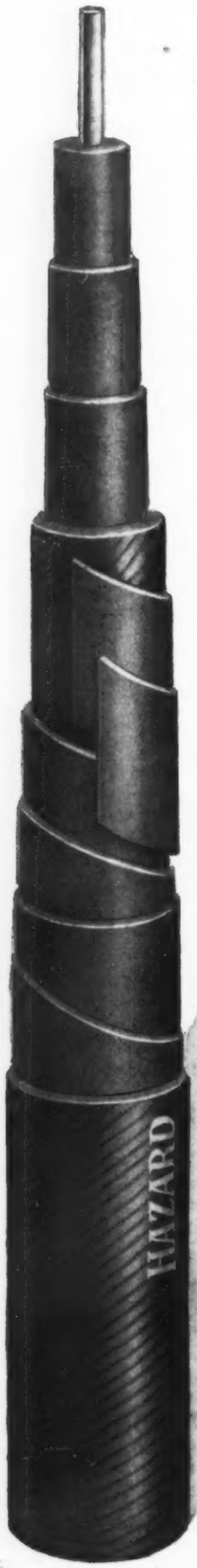

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ELECTRICAL WORLD

for the Week Ending

January 18, 1930

Comment On the News

A 104 PER CENT INCREASE in use of electricity for industrial-heat processes raised the usage to 6,000,000,000 kw.-hr. in 1929. With 93,000,000,000 kw.-hr. economically usable right now, apparently some industries have overlooked the fact that electric heat is no longer in the pioneer stage.

THE APPROPRIATION of $150,000 for standardization which has been underwritten by a large group of industries indicates a new spirit. Although no one wants standardization that will stifle initiative, enormous economies can be effected by avoiding varieties of apparatus that grow out of whims. Needless departures from standards cost the country millions of dollars.

ST. LAWRENCE WATER POWER may yet find early utilization in homes and industry if a commission which the New York Legislature has authorized the Governor to appoint can make sound recommendations for development. For the moment the long-discussed subject is taken out of political debate and placed in the hands of a survey committee. Can we hope for impartial, non-partisan answers to three questions: Is it an economical proposition? On what basis can the United States and Canada agree? How shall New York administer the construction and operation?

THE POWER CONTRACT announced this week between the Reading Company and the Philadelphia Electric Company again calls attention to the fact that twenty-one large railroads in this country have now more or less electrified trackage. Of these, fourteen purchase more than 800,000,000 kw.-hr. yearly. As other railroads study reasons and results, more electrification may be expected in all parts of the nation.

A "MUNICIPAL PLANT TRUST" is proposed in Nebraska. It would allow municipal systems to finance their rural lines out of future earnings and permit towns and villages to combine financial and engineering resources. It is encouraging to observe this display of initiative. Regardless of the legality of the scheme, it is difficult to comprehend how it will exclude politics—the major objection to municipal or government operation.

NEWS OF THE WEEK

Governor Roosevelt Accepts New Offer of Republicans on St. Lawrence

ENTHUSIASTIC acceptance by Governor Roosevelt of New York of a new bill on St. Lawrence River development introduced by the Republican legislative leaders on Monday, January 13, has broken—at any rate, for this session—the long deadlock at Albany over this question.

The bill provides for the appointment by the Governor of a commission of five members to make a survey of water-power possibilities and the most practicable plan for development. It contains a provision under which the proposed commission, "before inquiring into other plans for the development of the St. Lawrence," would be required to investigate thoroughly the practicability and advisability of the Governor's plan for public development.

In order to give Governor Roosevelt an absolutely free hand in the selection of the five commissioners provision is made for waiving confirmation by the Senate of his appointees. This is a most unusual departure from precedent. A sum of $200,000 is provided to defray the cost of the proposed survey. This liberal allowance, too, is thought to establish a new high record. Under the terms of the bill, the commission would be required to report to the Governor and Legislature on or before January 15, 1931.

State Senator John Knight, Republican leader, gave out a statement in which he said:

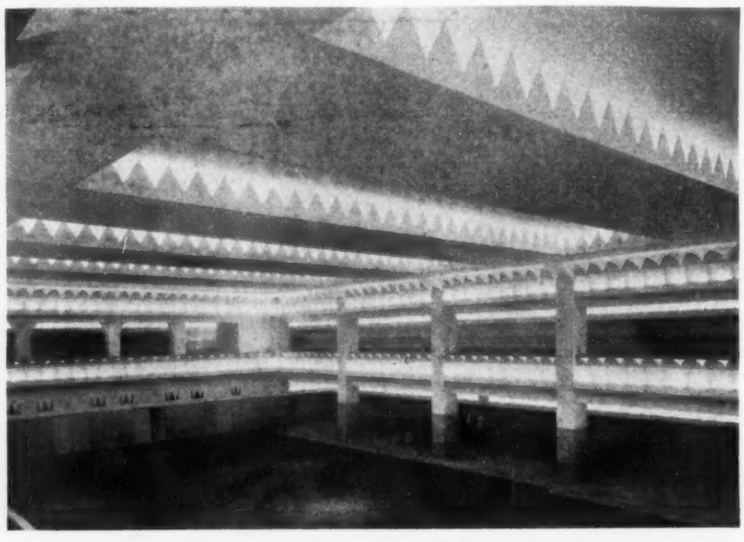
> This bill affords the Governor an opportunity through the commission of presenting to the people of the state all the facts in relation to the development of power on the St. Lawrence necessary to arrive at a proper conclusion. . . . If the commission should determine after a careful inquiry that the Governor's proposal is feasible, it must so report to the Legislature and submit a comprehensive plan.
>
> The bill declares it to be the policy of the state that the right of the people to the power resources shall remain forever inalienable. The commission would be required to consult the federal authorities and the Canadian authorities through the proper channels regarding the willingness of those interested parties to proceed with the undertaking. It would be under mandate to estimate the cost of the development and the probable price at which the power could be sold in the available markets and to report on ways of financing the project.
>
> The passage and signing of this bill would remove this subject from partisan controversy. The bill represents a substantial concession on the part of the Republicans. They make these concessions in order that a definite forward step in the development of hydro-electric power may be taken at once.

Senator Downing, the Democratic leader, congratulated his opponents on the measure and promised to support it.

Governor Hails Bill

Governor Roosevelt lost no time in accepting his opponents' offer, which he obviously regards as a surrender on their part. In announcing his attitude he said in part:

> I hope and believe that yesterday will go down into the history of our state as a red-letter day. The water-power bill introduced in the Legislature, while requiring certain changes to clarify it, is of such outstanding importance that every man, woman and child in the state who uses electricity has cause to rejoice.
>
> The bill ends a controversy over a great principle which began more than twenty years ago and has been acutely argued during each one of the past ten years. . . .
>
> I had asked for practical legislation on broad lines as follows:
>
> 1. The creation of a board of trustees to bring in a plan. This is given by the bill with the change of the word "trustees" to "commissioners."
>
> 2. These trustees (or commissioners) to bring in a plan for development of the St. Lawrence by a state agency.
>
> 3. The sale of electricity for consumers' use by the contract method. This is directed by the bill.
>
> 4. A report on this plan to the Legislature for approval or rejection. This is directed by the bill.
>
> 5. If accepted by the Legislature, the creation of permanent trustees to carry out the plan. This is completely set up by the bill.
>
> I am feeling very happy that the great principles involved are recognized by this proposed legislation.



BALLROOM LIGHTING IS DECORATION TOO

"Colorama," or "painting with light," was introduced to lighting engineers and interior decorators, under the auspices of the Illuminating Engineering Society, in the new ballroom of the St. George Hotel of Brooklyn, N. Y., on January 9, when 7,000 concealed red, blue, green and clear-glass lamps were manipulated under remote control.

While the passage of this bill, or this bill with such amendments as a public hearing may suggest, will lift the matter of the investigation of the feasibility and practicability of a power development out of the realm of politics, it will not eliminate the power question from the coming gubernatorial campaign. It will place the Governor in a strategic position, it is believed, to ask the people to elect a legislature which will speedily draft legislation to carry out the recommendations of the commission to be appointed by him, and just about what that commission proposes to recommend should be known, if the bill becomes a law, before the fall elections take place.

Before the introduction of this resolution Floyd L. Carlisle, chairman of the Niagara-Hudson Power Corporation's board of directors, had written to Governor Roosevelt suggesting that a public meeting should be held in Albany, presided over by the Governor, to which the members of the Legislature, representatives of the press and all interested citizens should be invited. At first inclining to disapprove the request, Governor Roosevelt, after the Republican announcement, wrote Mr. Carlisle accepting the idea.

▼ ▼ ▼

Arkwright Defends Utility Practices Before Trade Commission

OPPOSITION to public ownership and operation is not the sole inspiration of the public relations and publicity work of the utilities, Preston S. Arkwright, president of the Georgia Power Company and chairman of the public policy committee of the National Electric Light Association, testified on January 14, when hearings were resumed in the Federal Trade Commission's investigation. The only witness called upon to defend the association's activities, Mr. Arkwright prefaced an elaborate description of the association's public relations and publicity work with an explanation of its motives. Public antagonism is easily aroused against the public utilities, he said, because bigness itself excites suspicion and because they deal more intimately with more people than any other enterprise in the community.

As their charters, franchises, taxes and rates are all subject to public authority, the requirements imposed upon them may render the economical conduct of the business difficult, if not impossible, when public sentiment is inimical to them, Mr. Arkwright continued. Discussing the public utility companies as business enterprises, he observed that while the principle is generally accepted that the public interest does not require duplication of service, it does not follow that the business comes of its own volition. He explained that any large office building, hotel or manufacturing plant can supply its own electrical service and that in the household, while there is no substitute for electric light ordinarily, the rest of the home service is strictly competitive with gas, coal, oil and wood.

Wth reference to public ownership and operation, Mr. Arkwright said that the electric light and power industry did not initiate this question and that its position is one of defense against the proposal made by others to change from the present philosophy of private ownership to government ownership.

Cross-examined on Wednesday by Robert E. Healy, chief counsel for the commission, Mr. Arkwright asserted that neither consolidation of the ownership and control of power companies nor the interstate transmission of power presents any necessity for federal regulation of the public utility business. Citing the experience of his own company, Mr. Arkwright said that if the company buys power from outside of the state, the Georgia commission will permit it to absorb in its expenses any reasonable payments for that power, but it will not let the company pile up a large surplus gained from buying outside power at lower rates.

Questioned by Mr. Healy concerning the effect on rates of the consolidation of operating companies, Mr. Arkwright replied that in no instance had higher rates resulted, because, on the one hand, the rates are controlled by the state commissions, and on the other hand, the assets of the operating companies remain the same regardless of the unification of ownership in the hands of holding companies.

Creation of a gigantic corporation occupying the same dominant position in the power industry that the American Telephone & Telegraph Company does in the field of communication was visualized by Mr. Healy as the eventual result of the progressive consolidation of individual power companies. When asked for his opinion on this possibility, Mr. Arkwright said that he did not know of any such plan and that he had not the slightest intimation that it is contemplated.

Mr. Healy explained that his interrogations were inspired by the thought now widely entertained that in view of the rapid expansion of the power industry, Congress should decide once and for all whether to subject it to federal regulation.

At previous sessions of the commission, held on January 9 and 10, B. F. Weadock, special counsel for the utility associations, resuming the witness stand, testified that in only one case — in Connecticut—was there any reference to public ownership made in the bulletins distributed to the schools by public utility information bureaus. No attempt was ever made to conceal the source of such bulletins, which had the sanction of school authorities.

Mr. Weadock quoted figures prepared by William H. Hodge, identified with utility advertising for 20 years, which showed actual newspaper advertising expenditures of $6,200,000 in 1926 and $8,425,000 in 1928 — contrasted with totals alleged by critics of the utilities and put at $28,000,000 to $30,000,000 annually.

Other statements made by Mr. Weadock were that public utilities or their representatives tampered at no time with school textbooks, nor did they bring about revisions in textbooks to suit their viewpoints, though in a

ICE JAM IN VERMONT

International News Reel

An ice jam in the Missisquoi River in upper Vermont at the end of last week did no material damage to transmission systems. Ice backed up against a transmission line near Swanton, but electric service has been well maintained.

few instances incorrect statements were called to the attention of publishers or school authorities; that church pulpits were never used for discussion of utility matters, as had been alleged, and that the relations between utilities and college professors were of a technical and professional nature and not of the kind implied in some published statements.

▼

Bill at Albany Would Govern Investment Trusts

A BILL introduced in the New York Assembly this week by Edward S. Moran, Jr., of Brooklyn, embodies the first real attempt to regulate investment trusts. The bill recognizes that there is no such thing as an "investment trust" under the laws of New York State, all being chartered under the general corporation laws or, if organized in another state or country, allowed to do business by registering in the office of the Secretary of State.

The proposed measure sets up a technical description of the kind of corporation to be regulated. In brief, it places all corporations in a certain named category which sells or offers for sale its shares of stock, bonds or other securities the proceeds of which are invested or intended to be invested in bonds, stocks, other securities, etc., under the supervision of the superintendent of banks, who is empowered to make rules and regulations and establish a standard covering the kind and character of investments in which such corporations may utilize their assets.

Abolition of Submeters Will Bring Rate Cut of Ten Millions, Sloan Says

FOUR points stood out boldly in the testimony given on Wednesday, January 15, at the final hearing of the legislative commission which is investigating the Public Service Commission laws of New York State, by Matthew S. Sloan, president of the allied companies of New York City.

First—Mr. Sloan insisted that were submetering and resale of electricity abolished rates could be cut in Greater New York $10,000,000 annually and pledged himself that no portion of the return would be used to improve earnings.

Second—He declared that if he were permitted to make a service charge of $1 a month, he would so reduce energy charges that relatively few customers' bills would be increased at all and many would get a large reduction.

Third—He revealed that the allied Edison companies are preparing to bring upstate hydro-electric power into the city over the two high-voltage underground cables now built to Westchester County. This would effect a saving of $2,000,000 annually. If St. Lawrence power were available, Mr. Sloan said, it might in 1936 displace one-third of the local steam-generated energy.

Fourth—He opposed the regulation of holding companies except perhaps in cases where the operating company was so dominated as to be a "mere shell."

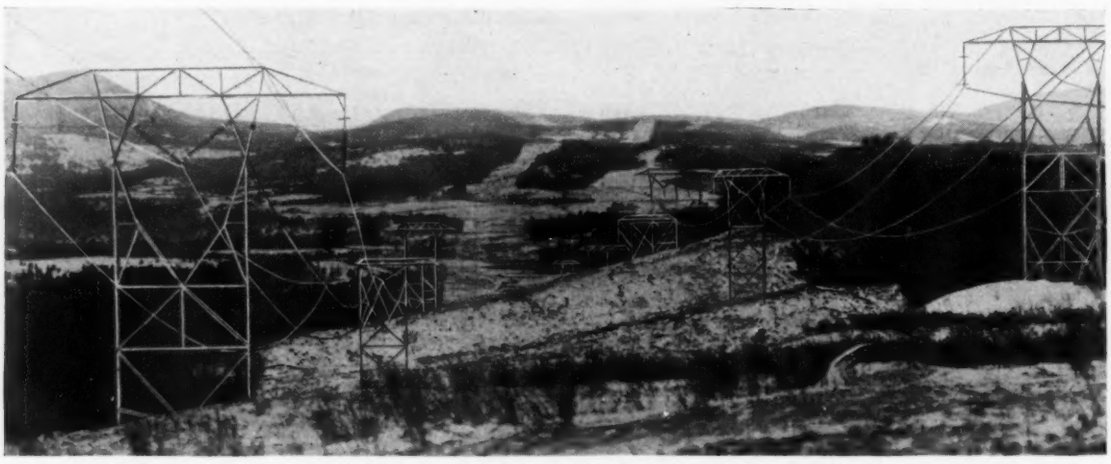
"Any one who knows me knows that if I stay in the electric utility business there will be reductions in rates, improved rate forms and continually improved service," Mr. Sloan declared.

The electric companies in the New York Edison system, Mr. Sloan said, had on August 31, 1929, an actual investment of $181,484,460 more than the capitalization. The investment exceeded the capitalization by 33.64 per cent. He submitted a table showing the total capitalization as $539,417,972 and book investment (which he explained as actual cost of plant and equipment, including land) as $720,902,432.

Other witnesses on Wednesday were Charles T. Russell, vice-president New York Telephone Company, who criticised the commission's dealings with that organization, and H. C. Hopson, vice-president Associated Gas & Electric Company, who defended holding companies.

George B. Cortelyou, president of the Consolidated Gas Company, denied at a previous session, held on Monday, charges made recently by counsel for the Community Council of New York to the effect that that company was carrying $200,000,000 of watered stock on its books. He insisted that the actual investment in the company is $82,332,726 in excess of the capitalization, which he quoted as $551,946,109.

Franklin H. Nickerson, vice-president of Consolidated Gas in charge of statistics and finance, was questioned closely by members of the inquiring commission on Mr. Cortelyou's state-



NEW ENGLAND'S FIRST 220-KV. LINE

Authority to build a 220-kv. three-circuit transmission line from the Fifteen-Mile Falls hydro-electric development of the New England Power Association through New Hampshire to Massachusetts has been granted. The line will be 126 miles long, terminating at Tewksbury, Mass.

ments, which he wholly supported.

Donald G. Richberg, general counsel for the National Conference on Valuation of Railroads, criticised public utility regulation and advocated that the property rights of utility security holders be abrogated and that they be placed in the same position as holders of government bonds.

On Tuesday Prof. H. P. Willis gave his views on the determination of a rate base, differing from Mr. Prendergast; George H. Howard, president of the United Corporation, testified that he favored regulation of holding companies if such companies substitute themselves for the operating company so that it ceases to be an independent entity, and Prof. M. W. Watkins of New York University advocated regulation of holding companies and supervision of their management contracts and financial organization.

At a hearing held late last week Justice Judson C. Dickerman, an expert attached to the Federal Trade Commission, dealt with the uniform system of accounts drawn up by the National Association of Railroad and Utility Commissioners and in force in most states, saying that while it does provide for adequately informative reports, so many items in this system have been made optional that utilities rarely provide commissions with all the information which it was originally intended they should. He urged that the optional clauses be omitted and suggested changes in classification.

▼

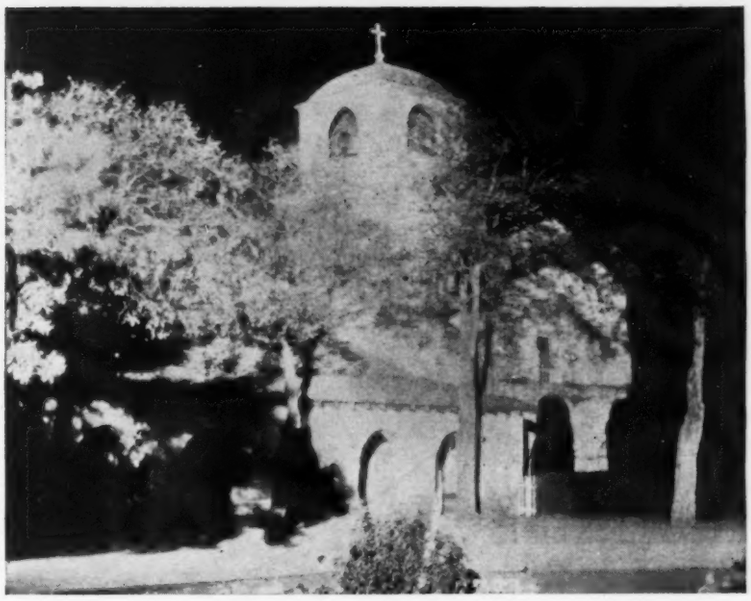
Electrical Industry's Aid Vital to Aëronautics

IMPORTANT problems of mutual service exist between the electrical and the aëronautical industries, W. P. MacCracken, chairman of the board of the New York, Rio & Buenos Aires Line, Inc., told members of the Electrical Association of New York at their January meeting. Mr. MacCracken, formerly Assistant Secretary of Commerce for Aëronautics, indicated several ways in which the electrical industry had helped and could further help this newer industry.

Some of the needs suggested were increased reliability of the internal-combustion engine, elimination of the magneto "whine" which interferes with radio reception, perfection of equipment for blind flying and the perfection of accessories of many kinds. Aëronautics, on its part, conserves time in transmitting blueprints, makes possible better surveys for power sites and lines and facilitates patroling, Mr. MacCracken said.

Earl Whitehorne, assistant vice-president of the McGraw-Hill Publishing Company, was re-elected president of the association. H. H. Barnes, Jr., New York district manager of the General Electric Company, was elected a vice-president, and the following officers were continued for another year: Vice-presidents, Theodore H. Joseph, Clarence L. Law and A. Lincoln Bush; treasurer, L. L. Strauss; secretary, John L. Owen.

WHERE SPANISH FRIARS TROD IN 1797



A new beauty was added on Christmas eve to the picturesqueness of the Mission San Juan Bautista, on El Camino Real, in San Benito County, Calif., through the installation of floodlighting by the Coast Counties Gas & Electric Company of Santa Cruz

▼

Electrical League Men Hold Winter Conference

ELECTRICAL league men from cities as far west as Denver and as far south as Memphis gathered this week in the auditorium of the Westinghouse Lighting Institute, New York, for the midwinter conference of officers and managers of local leagues. There were 138 men present, representing 52 communities. A three-day meeting began on Monday, during which the practical problems of league operation were discussed.

The delegates were guests of the Westinghouse Lamp Company at a luncheon on that day at which Clarence L. Law, general commercial manager of the New York Edison Company, presented the program of the Electrical Association of New York, organized last year for market development.

Philadelphia Electric and Reading Company Contract

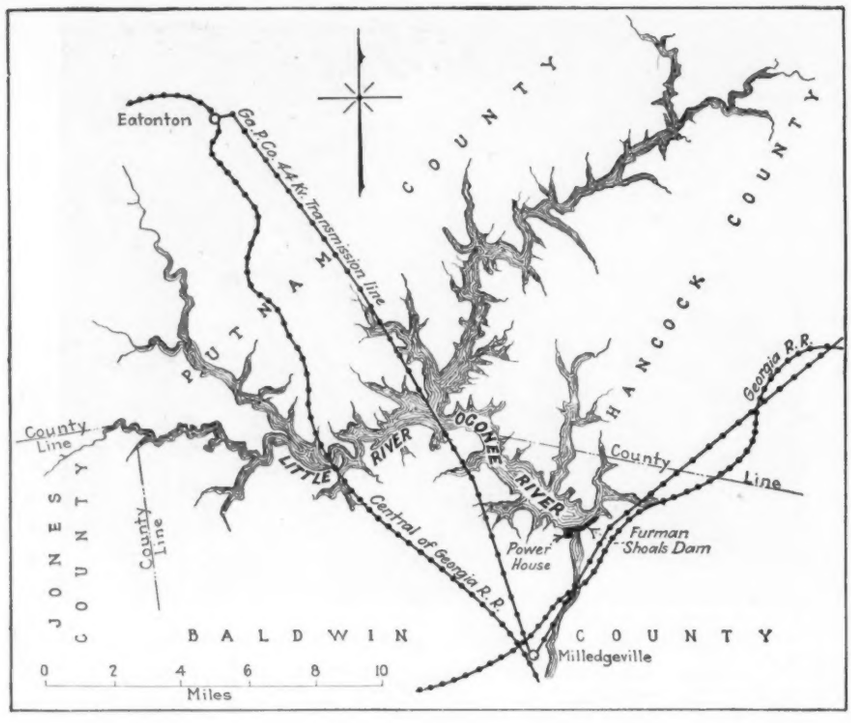
ONE of the largest contracts in the history of the public utility industry was signed last week by William H. Taylor, president of the Philadelphia Electric Company, and Agnew T. Dice, president of the Reading Company. It provides for the supply of electric power to the electrified suburban lines of the Reading system.

The contract will involve the ultimate expenditure of $1,500,000 a year. The power will be used for the operation of electric trains, including electric heating, and also for a new electric color light signal system which is being installed throughout the Reading's metropolitan Philadelphia district.

The contract will be in effect twenty years and may be extended ten years. It may be terminated at the end of ten years, however, by the Reading with certain provisions for the purchase of equipment installed by the Philadelphia Electric Company for the exclusive use of the Reading Company.

The Conowingo hydro-electric station on the Susquehanna River and several steam generating stations will supply power to be used by the Reading Company. The railroad will be supplied by underground 13,000-volt cables carried to a frequency-changing station to be erected at Wayne Junction by the Philadelphia Electric Company at an approximate cost of $1,500,000.

SITE FOR A NEW SOUTHERN HYDRO PLANT



Location of the lake to be formed by the 60,000-hp. hydro-electric development being constructed by the Georgia Power Company on the Oconee River, near Milledgeville, Ga.

Insulls' Maine Activities Attacked by Editor

AN ECHO of the vote last September on permitting hydro-electric power to be exported from Maine was heard in Florida last week, when Ernest Gruening, editor of the Portland (Me.) *Evening News*, spoke on propaganda at Winter Park before an "institute of statesmanship" held at Rollins College. He accused Samuel and Martin Insull of being "master minds" in electric utility propaganda and, referring to the Maine proposal and its decisive defeat, said:

In the five months intervening between passage of the bill and the referendum Maine witnessed the most extravagantly financed campaign in the history of the state. A high-pressure super-publicity expert was brought from Chicago; large weekly advertisements in a series appeared in every Maine daily and weekly except the Portland *Evening News* and the Kennebunk *Weekly*, which supported a municipal plant; weeklies all over the state developed suddenly editorial opinions for the power trust bill; the tags of "bolshevik" and "socialist" were put on those who opposed the interests; pamphlets were sent out; public utility speakers addressed clubs of all sorts; politicians were lined up and money handed out. In the closing days of the campaign advertising increased enormously in dailies including full and double pages.

According to Mr. Gruening, $500,000 was thus spent, and he believed that it "came from profits of a deal made in Texas by one of the Insull holding companies there."

▼

A. E. C. to Look Into Employment Deadline

DISCUSSION of the economic status of the American engineer was a major topic before the American Engineering Council at its session in Washington on January 9, 10 and 11. The council is engaged in making a study of this question. Arthur W. Berresford, the retiring president, referring to an alleged "forty-year deadline" in employing engineers, said it seemed unbelievable and that the A.E.C. by bringing any such conditions to light would perform a service to society.

Carl E. Grunsky of San Francisco, past-president of the American Society of Civil Engineers, was elected president to serve during 1930 and 1931. Vice-presidents were chosen as follows: L. B. Stillwell, New York; Gardner S. Williams, Ann Arbor, Mich.; O. H. Koch, Dallas, Tex.; L. P. Alford, New York. Dr. Harrison E. Howe, treasurer, and Lawrence W. Wallace, Washington, executive secretary, continue in office. Reports of officers and committees showed the council to be in a flourishing condition and to be adding constantly to its useful accomplishments.

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Steam at Buffalo Will Soon Tread on Hydro's Heels

DEFINITE announcement that an 80,000-kw. steam-electric unit is to be added to the equipment of the Buffalo General Electric Company, giving its Huntley station a capacity of more than 450,000 kw., was made this week by the Buffalo, Niagara & Eastern Power Corporation. This station now has a capacity of 225,000 kw., and construction under way will add 155,000 kw. to its rating. The unit just announced will complete the doubling of the present capacity and will place one of the country's largest coal-burning power stations almost in the shadow of the world's greatest hydro-electric development, Niagara Falls.

In this connection the Niagara-Hudson Power Corporation announces that while the hydro-electric output of its entire system remained virtually stationary in 1929, steam-electric output increased nearly 200 per cent.

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Radiotron Output Now 210,000 Tubes per Day

BACKED by the Radio Corporation of America, the General Electric Company and the Westinghouse Electric & Manufacturing Company, the RCA Radiotron Company, Inc., has been launched as maker of radio tubes. It is reported that the new company is owned 50 per cent by the Radio Corporation, 30 per cent by General Electric and 20 per cent by the Westinghouse company.

The RCA Radiotron Company will be able to manufacture 210,000 tubes a day in five factories, located at Harrison, Newark, Cleveland (two) and Indianapolis, with 1,147,000 sq.ft. of floor space. It will have 5,500 employees. Headquarters will be at the Edison Lamp Works in Harrison, N. J., and T. W. Frech, former vice-president of the General Electric Company, will head the new company, with George C. Osborn as vice-president in charge of sales.

Manufacture and research in radio tubes will be the task of the Radiotron Company. It makes possible a concentration of facilities of the three parent companies. The sales department of the Edison Lamp Works will move to Nela Park, Cleveland.

A. A. E. Seeks to Spread Compulsory Registration

PLANNED for years, a campaign is now under way to bring about compulsory registration of engineers through legislation in every state where it is not now in force. H. A. Wagner, president of the American Association of Engineers, which has supported the registration idea since 1917, says that the enactment of registration laws will be pushed in 22 states and that the standardization and strengthening of registration laws at present in force in 26 other states will also be sought. All national and state organizations of engineers and the 80,000 engineers eligible for registration in the United States will be asked to co-operate.

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Columbus Plans to Expand Municipal Plant by Hydro

PLANS for erection of hydro-electric power plants at the O'Shaughnessy and Griggs dams to increase the capacity of the municipal light plant of Columbus, Ohio, are being studied by engineers. The two plants proposed would use the water that now flows over the dams. They would cost about $350,000 and would have a generating capacity of about 12,000,000 kw.-hr. a year. Either Diesel oil engines or steam auxiliary units would be installed to operate the generators in case of low water or drought, and the power stations would be of the modern automatic type. The estimated cost includes transmission lines to bring the power to the Dublin Avenue plant for distribution.

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Grafton Power's Monroe Hydro Plant Approved

PERMISSION has been accorded to the Grafton Power Company to construct a dam and power unit on the Connecticut River, between Monroe, N. H., and McIndoes, Vt. This will be the third dam project in this territory, about 7 miles below the Fifteen-Mile-Falls project. Another is contemplated at Waterford, Vt.

The dam just sanctioned will have a length of 750 ft. and a spillway of 300 ft. There will be an elevation of 440 ft. and three crates 24 ft. wide at an elevation of 430 ft. Two additional sections 50 ft. long with 435-ft. elevation are planned. The power house including intake will be 125 ft. long and will be capable of developing 12,000 hp. The power will be transmitted to the lower Fifteen-Mile Falls plant for distribution in local territory.

An artificial lake of 540 acres will be created—127 acres in New Hampshire, 110 acres in Vermont and the remainder in the present river channel. Power not needed for local distribution will be transmitted to southern New Hampshire and Massachusetts.

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Preparations for Berlin World Power Conference

LIVELY interest in the second World Power Conference, which is to be held in Berlin in June and to be devoted chiefly to questions concerning the market for power, is already manifest abroad. So far 60 papers have been announced from America, sponsored by leading engineering and industrial associations. Among the authors are C. F. Hirshfeld of Detroit, G. A. Orrok of New York, A. D. Bailey of Chicago and William LeRoy Emmet of Washington.

The majority of the papers deal with the distribution and utilization of electricity. Treatises on the utilization of electricity in the aluminum industry and in the household and on railroad electrification are included. Storage for water power, standardization, education and training of engineers and employees and the part played by legislation in matters of power economy are other topics.

In addition to the scientific discussions there will be a reception in the Reichstag, an opening ceremony in the auditorium of the Kroll Opera House, a great "world power festival" and a number of informal meetings of engineering interest.

At present the list of works to be visited numbers about 200. About half of these are power stations and gas works, and the other half are energy-consuming enterprises, such as coal mines and steel works, chemical works, factories which manufacture electric machines, steam turbines and internal-combustion engines, shipbuilding yards, wireless stations and so on. Seven different itineraries for tours radiate in all directions from Berlin, taking in the immediate environs of the capital, the industrial centers of the Rhineland and Westphalia, Baden, Bavaria, Upper Silesia, Pomerania and East Prussia and the Hanseatic towns of Bremen, Hamburg and Lübeck.

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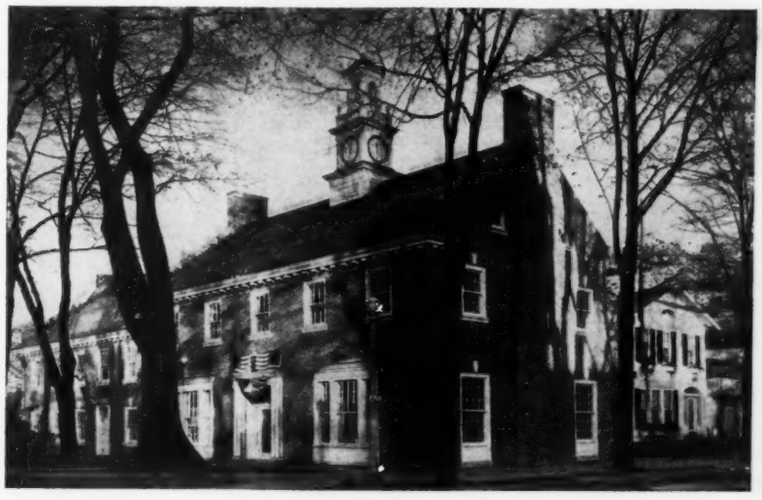
Long Island Companies Enter Close Relations

LONG ISLAND (N. Y.) utilities controlled by E. L. Phillips & Company have been brought under unified control by recent mergers. The Long Beach Power Company has been absorbed by the Queens Borough Gas & Electric Company, and the Sag Harbor Electric Light & Power Company, the Public Service Corporation of Long Island and the Long Island Gas Corporation have been merged into the Long Island Lighting Company, which already owned the Queens Borough organization as well as the East Hampton Electric Light Company and some gas concerns.

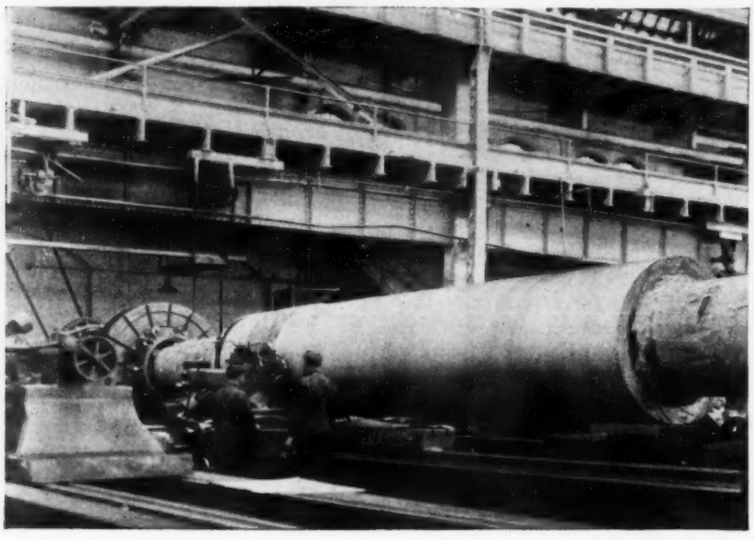


BEAUTY AND UTILITY GO TOGETHER

At Monroe, Mich., the Detroit Edison Company recently opened this suburban office building, of which the attractive old-style architecture embellishes the public square it faces.

Waukegan to Have 115,000-Kw. Generator

A UNIT now being manufactured by the Allis-Chalmers Manufacturing Company, Milwaukee, for the Waukegan generating plant of the Public Service Company of Northern Illinois will rank with the biggest yet made. This



steam-electric single-shaft turbo-generator will have a rating of 115,000 kw., 60 cycles, rotating at 1,800 r.p.m. It will be the fifth large Allis-Chalmers unit in this plant, previous units being rated at 25,000 kw., 35,000 kw., 50,000 kw. and 65,000 kw.

The picture shows the rotor forging, perhaps the largest ever made. It is approximately 42 ft. long and weighs 134½ tons.

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A.S.A. Expenditures for Three Years Underwritten

UNDERWRITING of the finances of the American Standards Association for a period of three years, to permit a total annual expenditure of $150,000, is now being completed, President William J. Serrill announces. This fund permits an increase in the 1930 budget of $80,000 over the previous budget of the association and is expected to result in an expansion of national standardization work affecting practically all industries.

The fund is being underwritten by a large group of industrial organizations. The underwriting was arranged by a committee consisting of James A. Farrell, president of the United States Steel Corporation; Gerard Swope, president of the General Electric Company; George B. Cortelyou, president of the Consolidated Gas Company of New York, and F. A. Merrick, president of the Westinghouse Electric & Manufacturing Company. Because of the rapid growth of the industrial standardization movement in this country, the underwriting was planned to permit immediate expansion of the work of providing authoritative national standards while permanent financing is under way. It is expected that this financing will be completed during the three-year period of the underwriting.

Among the companies joining in the underwriting are the Aluminum Company of America, American Telephone & Telegraph Company, Bethlehem Steel Company, Consolidated Gas Company of New York, Detroit Edison Company, General Electric Company, General Motors Corporation, Gulf Oil Corporation of Pennsylvania, Public Service Corporation of New Jersey, Standard Oil Company of New Jersey, United States Steel Corporation, Westinghouse Electric & Manufacturing Company and the Youngstown Sheet & Tube Company.

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Southern Colorado Power Builds Line up Royal Gorge

COMPLETION of a suspension bridge over the far-famed Royal Gorge of the Arkansas River, near Canon City, Colo., 1,050 ft. above the stream, will bring also an inclined scenic railway to run from a new Denver & Rio Grande station in the gorge to the top of the cliffs. To furnish the inclined road with energy the Southern Colorado Power Company has completed a line to the top of the gorge. A large battery of floodlamps will be installed by the bridge builders to illuminate parts of that structure and the abutting scenery.

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Ontario Utility Holds Its Own in Niagara District

THOUGH right in the Niagara peninsula, the voters of St. Catharines, Ontario, have just decided in favor of continuing competition with the city-owned, province-controlled hydro-electric system by carrying a by-law authorizing a ten-year renewal of the franchise of the Lincoln Electric Light & Power Company, a subsidiary of the Dominion Power & Transmission Company. Lincoln Electric Light has been in business in St. Catharines for 40 years.

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Seattle Asks Bids for Diablo Dam Equipment

UNTIL 10 a.m. on February 28 the Seattle Board of Public Works will receive bids for furnishing two generating units and auxiliary equipment to be installed in a power house below the Diablo Dam—part of the city of Seattle's hydro-electric development project on the Skagit River. The installation will cost approximately $2,000,000. Each unit is estimated at $700,000, and the remaining $600,000 will be spent in the construction and equipment of the power house. The generators will be rated at 60,000 kva. and will be vertical units driven by reaction-type waterwheels.

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Tacoma Files on Its Packwood Lake Project

FILINGS have been made in Olympia, Wash., on behalf of the city of Tacoma, contemplating a hydro-electro power development on the upper reaches of the Cowlitz River, designed to supplement the city's Lake Cushman and Nisqually River plants. The plan includes diversion of water from Clear Fork stream into Packwood Lake by a tunnel 5.4 miles long and the impounding of 65,000 acre-ft. in the lake by a dam, 105 ft. high and 600 ft. long, of rock-fill and concrete-core construction. The cost of this is put at $2,255,700.

Water from Lake Creek would be con-

veyed to the power plant by means of 16,000 ft. of tunnel and 6,000 ft. of pipe line, this work and the generating plant to cost approximately $6,120,000. There would be potential continuous horsepower of 40,000 to 50,000, with a head of more than 1,700 ft. The project will justify probably 60,000 hp. to 90,000 hp. in generator capacity. The filings followed closely surrender by the city of Tacoma of options on prior filings on the Duckabush, Dosewallips and Hamma Hamma Rivers, in the Hood Canal district.

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Portland Utility and City Dispute About Intangibles

ALLEGED inclusion of certain intangibles in the 1916 valuation of the Portland (Ore.) Electric Power Company by the Oregon Public Service Commission formed the basis of the principal controversy in the hearing on the valuation of that company's properties resumed December 26 in Portland and completed January 2. Voluminous exhibits pertaining to different items of property and to operating costs were introduced by the city, the company and the commission itself.

The intangibles which Carey & Harlan, the city's experts, alleged had been erroneously included in the 1916 valuation amounted to more than $13,000,000, segregated as follows: Overhead on real estate, $645,000; value of water rights, $4,187,000; development, cost $4,292,000; depreciation, $4,220,000.

Controversy arose because the commission's valuation of all the company's utility property, set in 1916 at approximately $46,000,000, was not itemized. Analysis of that case, in which consideration was given to original cost, prudent investment value, the cost of reproduction and the company's financial structure, indicated that the prudent investment value at that time, divested of any intangibles whatever, amounted to $40,000,000 in round figures. The company contended that $1,100,000 of the other $6,000,000 represented working capital and that the balance was the reasonable value of water rights, going-concern value and other legitimate intangibles. One of the main contentions of the city was that in 1916 more weight was given to the reproduction cost theory of valuation than to any of the other factors and that depreciation, which should have been deducted in a valuation based on that theory, was ignored.

Thirty days was granted to the city in which to file a brief and ten days to the company in which to reply, after which the city was allowed five days for its rebuttal brief. There was unanimous agreement that there should be strict separation of the street-railway branch of the business from the light and power branch.

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Coming Meetings

National Electrical Manufacturers' Association—New York, Jan. 20-24. S. N. Clarkson, 420 Lexington Ave., New York.

Great Lakes Division, N.E.L.A.—Commercial Section, Edgewater Beach Hotel, Chicago, Jan. 20-22. T. C. Polk, Room 910, 140 South Dearborn St., Chicago.

North Central Division, N.E.L.A.—Commercial Section, St. Paul Hotel, St. Paul, Jan. 20-21; Engineering Section, Nicollet Hotel, Minneapolis, Feb. 24-25. J. W. Lapham, 803 Plymouth Bldg., Minneapolis.

National Electrical Credit Association—New England Division, University Club, Boston, Jan. 21. F. P. Vose, 1008 Marquette Bldg., Chicago.

National Association of Purchasing Agents—Public utility group, Mayflower Hotel, Washington, D. C., Jan. 23-24. G. A. Renard, 11 Park Place, New York.

American Institute of Electrical Engineers—Winter meeting, New York, Jan. 27-31. F. L. Hutchinson, 33 West 39th St., New York.

National Electrical Wholesalers' Association—Pacific Division, Del Monte, Calif., Jan. 31-Feb. 1.

Artistic Lighting Equipment Association—Washington, Feb. 9-15. C. L. Benjamin, 420 Lexington Ave., New York.

Northwest Electric Light and Power Association—Commercial Section, Spokane, Feb. 13-15; Accounting Section, Portland, March 17-18; Engineering Section, Aberdeen, Wash., probably week of March 23. B. Snow, 1206 Spalding Bldg., Portland, Ore.

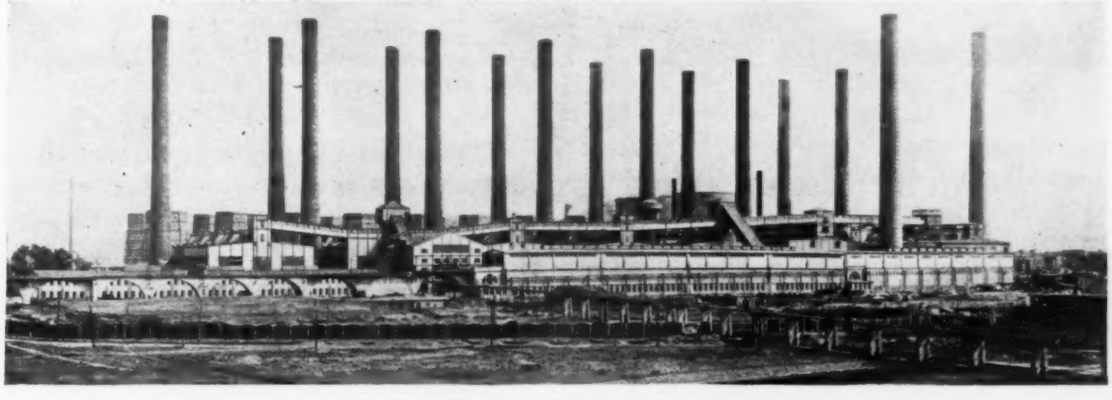
Oklahoma Utilities Association—Tulsa Hotel, Tulsa, March 11-13. E. F. McKay, 1020 Petroleum Bldg., Oklahoma City.

Illinois State Electrical Association.—Hotel Abraham Lincoln, Springfield, March 19-20. George Schwaner, Springfield.

National Electric Light Association—San Francisco, June 16-20. A. J. Marshall, 420 Lexington Avenue, New York.

Plan Another Section of British Grid Scheme

IN CONNECTION with Great Britain's national electricity scheme a plan has been prepared for the distribution of electricity in northeast Shropshire at an estimated cost of $1,500,000. This area comprises the industrial districts of Coalbrookdale, Iron Bridge, Oakengates, Wellington and other localities and contains a population of 68,000. The first part of the scheme involves 33,000-volt transmission lines to connect Iron Bridge, Wellington, Newport and Shifnal, with double-circuit lines where it is necessary to provide alternative routes as a safeguard against breakdown. The generating station at Iron Bridge is now well advanced, and the co-ordination of existing means of production throughout the West Midlands area, together with the linking up of numerous districts effected.



STACKS ENOUGH TO GO AROUND AT GOLPA-TSCHORNEWITZ

Completion of one of Europe's greatest power houses on the Halle-Leipzig line gives Germany a plant with twin generating units rated at 100,000 kw. each. "Brown" coal is burned under the boilers

HYDRO DEVELOPMENTS IN JAPAN EXCEED 3,000,000 HP.

An increase of 60-fold in twenty years is the record of Japanese hydro-electric progress. This 46,000-kw. Soyama plant of the Showa Electric Power Company is representative of best practice in that country and is a part of a 250,000-hp. development now well under way

EDITORIALS

L.W.W. MORROW
Editor

Industrial Heating Sets the Pace

ACCORDING to the best estimates, industrial electric heating sales during the past four years in fourteen representative power companies of this country gained 104 per cent. Data compiled by the N.E.L.A. committee on this subject indicate that the industrial heating load is increasing at a faster rate than any other class of central-station business. In this four-year period this young and lusty child of the electrical industry has grown from 4.5 to 5.8 per cent of the whole family of kilowatt-hours. Four of the companies listed by the committee now sell from 16 to 30 per cent of their total output in energy for industrial heating.

This rapid increase, as the committee well says, is due to the fact that industry understands to a greater extent than ever before that a mere comparison of costs of heat sources on a thermal basis means nothing without a complete investigation of over-all costs, the only figure that results in profit or loss.

It is a pretty late day to have to prove that this kind of business is worth while. The prorated estimated revenue in 1929 from industrial heating sales in the United States of six billion kilowatt-hours is more than $70,000,000. Future development depends for its speed in no small degree upon the alacrity with which the member companies of the industry profit by the example of the "shock troops" of the power divisions whose methods are winning striking victories over skepticism and conservatism in manufacturing circles.

If every commercial department will organize for heating survey work, analyze markets intelligently, apply the scientific method to impartial study of the best methods in both combination and single-service companies, work with suitable rate structures and capitalize every advantage disclosed by the use of electric heat in the proper places, the growth of this business is likely to be astounding.

Spirit Behind Contracts Decides Purchase of Power

SIGNING this week of a contract whereby the Reading Railroad enters into agreement to purchase power for electrified operation from the Philadelphia Electric Company increases the number of large electrified railroads in this country which purchase power to fifteen. Among other notable agreements in the last two years are those involving the Pennsylvania, the Great Northern and the Boston, Revere Beach & Lynn railroads.

Judging from the fact that twenty-two railroads in this country and sixty-six in foreign countries have electrified sections of their railroads and have experienced definite benefits therefrom, it seems only a question of time before others will be convinced of the economy of this policy under certain conditions. If the advantages experienced by existing electrified railroads serve as any criterion, it will pay all railroads to look into the possible benefits from increased traffic facilities, especially at terminals, on heavy grades and for suburban service, and from the elimination of smoke in tunnels and congested centers. While reduced cost of operation may be called into question by unelectrified railroads, it is significant that eleven electrified railroads definitely report reduced operating expense.

It is quite natural for large railroads to think of generating their own power, but the twelve reasons cited in the issue of the ELECTRICAL WORLD for December 8, 1928, in favor of the

Pennsylvania Railroad's purchasing all energy for its recent hundred-million-dollar electrification project should make any railroad executive think twice before committing his company to generation of its own power.

Reasons for electrifying and purchasing power being plentiful, the nature of contracts deserves the most attention of railroads and power companies, since the decision regarding power supply frequently hinges on contract requirements. The Illinois Central and Pennsylvania contracts indicate that these two railroads and the power companies serving them recognized that both parties are in the utility business and that neither should be unnecessarily handicapped. With the mutual recognition that each party to the contract must protect its investment, meet operating contingencies and still pay dividends to investors, adoption of purchased power should encounter little opposition.

Will There Be an Impartial Commission?

THE Republican hydro-electric power bill just indorsed by the Democratic Governor of New York embodies provisions which could to a great extent lift the twenty-year controversy regarding state ownership of water powers out of politics. Whether it will lead to a non-political analysis and finding depends on the make-up of the commission and on whether the members make use of their prominence to further ambition.

While the act definitely commits the state to acceptance of the policy that natural water powers upon or adjacent to the St. Lawrence River, now controlled or hereafter recovered by the state, shall forever remain vested in the people, it does not by word or inference declare for state development, operation or sale of hydro power. The act only authorizes the Chief Executive of the state to appoint a commission of inquiry into the best program, appropriates $200,000 for its expenses, outlines the information which must be included, prescribes the type of organization which shall be adopted *if* state development and sale of power is recommended, and finally emphasizes the stipulation that no power to carry out recommendations of the commission is to be granted until these have been submitted to and approved by the Legislature.

That is to say, the Governor's program of state development and sale of hydro energy will be investigated, but, if the commission is open-minded, it may be rejected and some other scheme recommended as preferable.

Although the act definitely applies to St. Lawrence development, it is difficult to comprehend what New York State alone can do about this, because the problem can only be settled by international treaty. Nevertheless, the investigations of an impartial commission, provided that one be selected, may speed the day when arrangements can be made which will be mutually satisfactory to the United States and Dominion governments and also to the territories of each country adjacent to the river.

As to state control of water powers, not even its stanchest advocates have convincingly removed the chief objections thereto, which are the lack of initiative and progressiveness and the ever-present machinations, inefficiencies, salaried wallflowers and red tape *ad infinitum* which accompany political undertakings. These objectionable features can far more than offset any savings that the sincerest and most optimistic advocates of state or government ownership promise.

Public, Architect and High-Intensity Illumination

WHY is high-intensity illumination so slow in becoming popular with the American public in general and the American architect in particular? Its harmlessness and great benefits have been demonstrated time and again.

The American public is not stingy. It spends freely for comfort. It is often extravagant. Yet it has been difficult to persuade even the rich that high intensity is worth the price. This is not merely inertia, because the American public is very quick in accepting sound new ideas and even new fads.

Slowly the architects are getting away from merely showing outlets on their plans and allowing a stated sum for fixtures to be purchased from the lowest bidder. They are beginning to devote more

time to lighting and to co-operate with the illuminating engineer. Yet, where can the high intensity be found?

Perhaps the approach has been from the wrong angle. Perhaps those who attempt to popularize the idea know a great deal about lighting but are not trained to appreciate the architect's problem of beauty of form and color and the interior decorator's problem of a pleasant home atmosphere. But the main reason is—let us be honest about it—that while electrical men have demonstrated the benefits of high intensity, they have so far failed to show either the architect or the public how they can be utilized—particularly where low ceilings are a factor—without sacrificing artistic effect. The reason for this is obvious. Lamp development has made enormous progress owing to concentrated laboratory effort, whereas fixture development has lagged behind, because it has been left to individual effort. The average so-called "inclosing unit" is an artistic monstrosity whether it be old or modernistic.

Before high intensity becomes as popular as it should be with the public and with the architect it will be necessary to concentrate effort on quality, not on intensity. It is necessary to find the means for furnishing high intensity without glare, without excessive heat, without the necessity of sacrificing any of the architect's ideas of form and color. Such means are not generally available now. They are only available for special cases. When they do become generally available the architect and the public will not only accept high intensity but will demand it and get it.

Manufacturers' Support of Local Leagues

A JOINT committee representing the National Electrical Manufacturers' Association and the National Council of Electrical Leagues has been at work studying the whole problem of the financial support of local leagues. In 1928 the total budget for all electrical leagues in the country was $668,000. Of this amount, approximately $345,000 was contributed by the power companies operating in the cities served by these leagues. The wholesalers, contractors and dealers of those communities provided $255,000. The manufacturers of the electrical industry contributed $68,000. Only a very few manufacturers gave any financial support to more than one league, usually the league in their home town.

There are today, in all, 118 leagues operating in the United States and Canada. Forty of these leagues maintain headquarters staffs and are engaged in co-operative activities for the development of the local electrical market. The record of the past ten years has proved that this form of organization is a productive influence, and the league movement is slowly progressing. Several cities are operating on a considerable scale—notably Cleveland and Chicago—and New York is now in process of establishing a comprehensive program of co-operative activity.

The electrical industry has indorsed the league idea as a useful agency for the promotion of local unity among electrical men. From the beginning, however, league work has been hampered by lack of financial backing. Power companies have been generally willing to contribute an amount equal to that provided by all other interests. But the total has been too small for any large accomplishment. The difficulty has been to devise a practical basis for determining which leagues were really entitled to support, so that national manufacturers could assist deserving organizations with liberality without bringing down upon themselves disproportionate demands from many other cities where such liberality was not justified.

A thorough study of the work of all the leagues has now been made, and the joint committee has arrived at a simple but effective plan whereby those leagues that can provide a proper record of organization, budget, performance and program are to be certified by the committee as worthy of support. It will be recommended to members of N.E.M.A. that all leagues receiving the certificate of approval be given adequate proportionate support. It is believed that manufacturers will welcome this assurance that money devoted to the work of these leagues will be efficiently expended, since they are known to be well founded, soundly administered and properly financed. This system of rating leagues should tend to raise the standard of league work and to bring an increased vitality to this very necessary operation in the local development of the electrical market.

Japan's Latest Hydro Plant

46,000-kw. Soyama plant represents latest practice. American methods and equipment are largely used

HAVING abundant water-power resources and being less favored with coal supply, it is natural that Japan should give its attention to the development of hydro-electric power. Much progress already has been made. In 1906 there was only 38,622 kw. developed water power, but the census of 1927 shows the total development to have reached 2,111,087 kw.

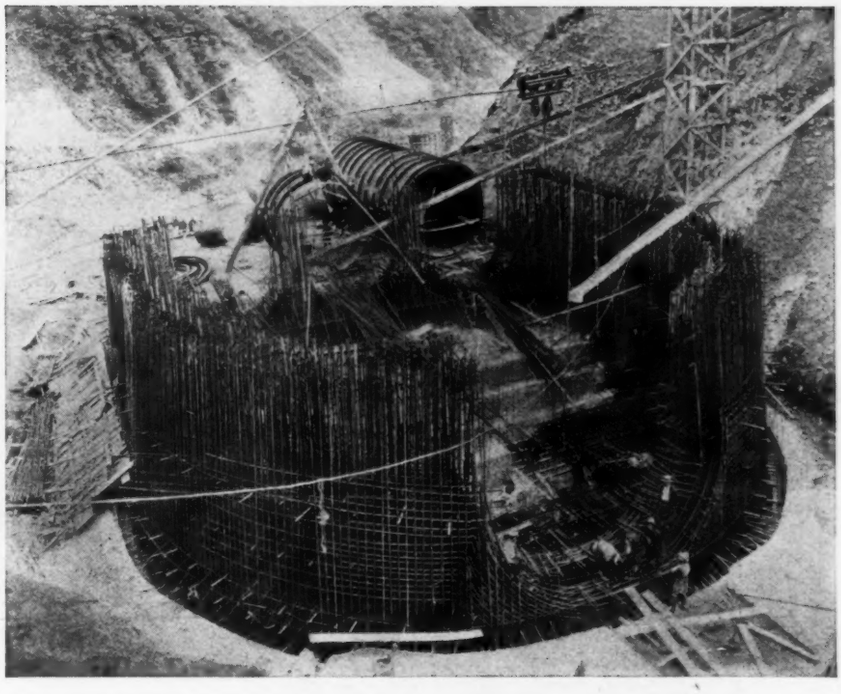
As an example of dam type development, the Soyama plant of the Showa Electric Power Company is one of the latest and best installations. It is the first of a series of plants to be built by this company in the Hokuriku district, where the ultimate development will exceed 200,000 kw. Shogawa plant No. 2 (Soyama plant) will contain three 27,000-hp. vertical turbines operating under an effective head of 66.8 m. (220 ft.), driving three 20,000-kva. generators. The generator voltage of 6,600 will be stepped up to 154,000 volts for transmission over a distance of 186.5 miles to Osaka.

The plant is located on the Shogawa River in the high plateau Hida district. The Shogawa River is about 118 km. (73 miles) long, emptying into the Japan Sea near the city of Takaoka. The flow of this river is subject to less change than other rivers of Japan, making it peculiarly adaptable to hydro-electric development. Its minimum flow is 30 cu.m. per second (353 sec.-ft.), maximum flow 3,200 cu.m. per second (3,770 sec.-ft.) and its average flow 60 cu.m. per second (706 sec.-ft.).

The first important problem to consider was that of transportation. It was no easy problem to solve and considerable time and money were spent by the company. A transportation road more than 18 miles in length had to be constructed over the summit of a mountain 2,300 ft. high and an aërial cable-way of approximately

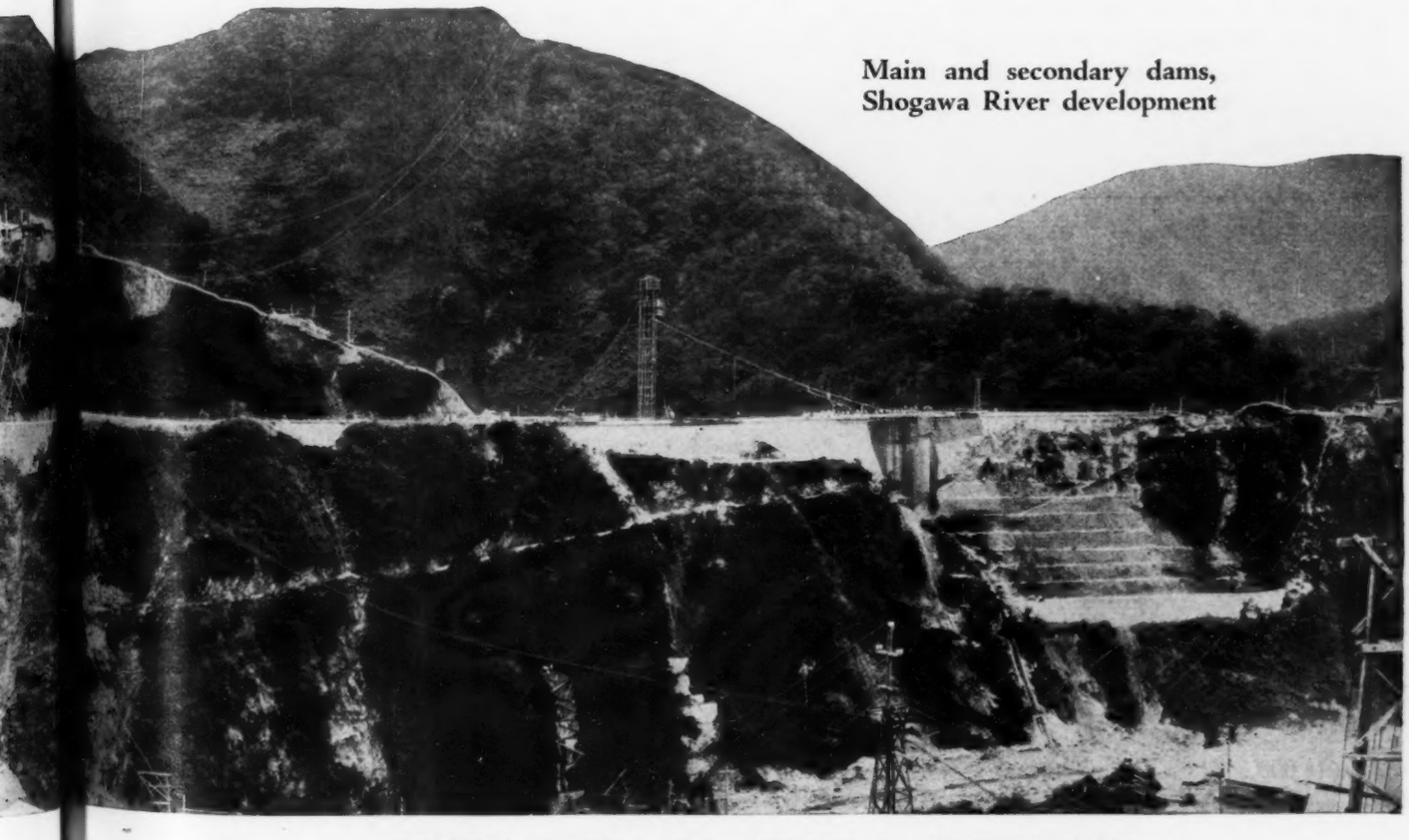
By T. KUGA

Water Power Engineer
Showa Electric Power Company, Ltd.,
Tokyo, Japan



Heavy reinforcing for surge tank

½ ton capacity and 5.3 miles long was built from the nearest railway station over a mountain 3,600 ft. high direct to the dam site to carry cement and other materials of lesser weight and bulk. To transport the heavy electrical and hydraulic equipment a unique method was adopted. Apparatus not exceeding 15 tons in weight was loaded on boats at a point 6.6 miles below the plant and pulled upstream either by gasoline winches or man power, according to the weight of the load. When the swift current, rapids and turns and roughness of river bed and steepness of both banks are considered, the difficulties of haulage are readily appreciated, yet this method



Main and secondary dams, Shogawa River development

Gravity type dam, 240 ft. high, impounds 89,000 acre-ft. of water

proved to be the practical solution under the circumstances.

A concrete dam of the gravity type, 73.2 m. (240 ft.) high, impounds 33,000,000 cu.m. (89,000 acre-ft.) of water. Twelve Tainter gates arranged for either manual or electrical operation provide spillway capacity. An intake structure located about 43 m. (150 ft.) upstream from the dam is connected by a pressure tunnel with the surge chamber. The pressure tunnel is 500 m. (1,800 ft.) long, 5.7 m. (20.5 ft.) inside diameter and is heavily reinforced. The surge chamber is 32 m. (115 ft.) high, 16 m. (57.5 ft.) in diameter and is of heavily reinforced concrete, as shown by one of the accompanying illustrations. Three riveted steel penstocks, 103 m. (370 ft.) long and 4.115 m. (14.75 ft.) in diameter, extend to the power house.

At the site of the dam the river makes a complete horseshoe turn and it was decided to construct two dams, the main and secondary; the former being located at the apex of the horseshoe and the latter being located a few hundred feet upstream from the main dam for the purpose of reinforcing the left embankment against the pressure of the impounded water and also to keep the embankment level higher than that of the reservoir water. This dam is of reinforced concrete, of the non-overflow gravity type. It is 25 m. (82 ft.) high and 180 m. (583 ft.) long.

The power house is of reinforced concrete construction with roof of sufficient strength to withstand the load of heavy snow, which reaches a depth of more than 10 ft. Instead of using the regular truss-roof formation reinforced concrete beams were substituted to reduce the height of the structure. The floor has an area of 1,300 sq.m. (14,000 sq.ft.), is 22 m. (72 ft.) wide and 58.6 m. (192 ft.) long. Heavy supporting walls or concrete barrels were built on the turbine casings to the height of the generator floor to sustain without vibration the enormous combined weight of generator, turbine runner and water thrust, and also heavy stresses due to possible short circuit.

The power house contains three 27,000-hp. vertical single-runner turbines of the Francis type made by the I. P. Morris Company. The runners are cast steel in one piece, the main guide bearing is of lignum vitæ, the draft tube is of the Moody spreading type made of reinforced concrete lined with steel plates in sections, the top of the hydrocone is capped with a steel plate and all rivets are either welded or calked to prevent possible leakage and also to lessen friction. A butterfly valve 3.2 m. (10.5 ft.) in diameter with a bypass valve is provided for each turbine. These valves may be operated either by hand or oil pressure. In case of loss of oil pressure on the governor pressure system the valves can be operated by oil pressure from a special tank provided for just such an emergency. A Morris-Pelton actuator type of governor, belt driven from the main shaft, is used and is located on the generator floor.

The turbines are guaranteed to give 89 per cent efficiency under full load at normal head and speed variation not to exceed 21 per cent when full load is suddenly thrown off and 26 per cent when suddenly applied. There are two rotary pumps for pressure regulators, the capacity of one pump being sufficient for the operation of three governors. The pumps are so arranged that they can be separately driven electrically by two motors or by one horizontal water turbine which is used as a spare.

The Dengyo Prime Mover Works, Ltd., Tokyo, furnished two 900-hp., horizontal, single-runner, single-discharge, Francis type turbines for two exciters.

The three generators are rated at 16,000 kw., 200 r.p.m., 6,600 volts, 60 cycles, 80 per cent power factor and were made by the General Electric Company. The machines are capable of operating at 105 per cent terminal volts at full load continuously and one machine is used to carry the load on the 154-kv. Osaka transmission line. The neutral of each machine is grounded through an oil circuit breaker. Two 500-kw. exciters of the Shibaura Engineering Works are direct-connected to the Dengyo-sha's turbines. One machine will supply field current for the three generators, leaving one unit as a spare. Two Tirrell regulators operate on the exciter fields for generator voltage regulation.

6,600-volt bus I-beam suspended

Due to heavy currents and the consequent troublesome question of local heating by eddy currents a new departure on the 6,600-volt bus system is being tried. Instead of using ordinary busbar compartments of reinforced concrete the main busbars are suspended edgewise from I-beams, rigidly clamped on both sides by porcelain insulators, which also serve as spacers. All busbars and taps are completely insulated with micarta boards. A double bus system is used consisting of six layers of copper bars ¼x4 in. The generators are connected to the bus through the usual method of disconnecting switches and oil switches of special design. Two generators are so arranged that they can be connected to either of the buses or directly to the two main transformer banks, while the third generator has connection to the 6,600-volt bus only. The oil switches have a rupturing capacity of 1,000,000 kva. and before acceptance of design a series of tests was made to determine local heating by eddy currents.

Another innovation is that copper bars are substituted in place of paper-insulated cables. Paper-insulated cables have shown defects in many instances after a year or so of operation; especially is this so when their terminals are at different levels and are subjected to varying temperatures. Thus connections between generators, buses and transformer banks are all made up of copper bars.

Two transformer banks consisting of three single-phase, 13,400-kva. units each, with one spare, are delta-connected on the low side and Y-connected on the high side to step up from the generator voltage of 6,600 to 154,000 volts for transmission. Neutrals on the high-tension side are grounded through a 600-ohm resistance. The transformers are of the outdoor core type, water cooled, oil-immersed and were made by the Shibaura Engineering Works of Tokyo. The coils and cores arrived separately and were assembled, dried and immersed in oil in the field. A new method of drying the transformers under vacuum was tried and proved not only successful but desirable from many points of view when working with such limited field facilities as were encountered here.

The high-tension bus structure is rather simple and hardly needs comment. Due to the excessively heavy snow falls all of the operations of the oil switches and disconnecting switches are performed from underground and for this purpose an underground passage connects the power house building and the operating compartment. A special heating device is furnished in the mechanism chamber of the circuit breakers to keep them from freezing. Tractor type disconnecting switches are used. Two sets of oxide film arresters complete the installation at this point.

The main switchboard is of the benchboard type, containing seven panels. Precision meters and all known latest type devices for protection against overload, short circuit, unbalancing, grounds, etc., are provided. Neither the Tainter gates and Stoney gates of the main dam nor those of the intake are controlled from the main board.

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Economies in Duct Construction

THE avoidance of choking city traffic in duct construction calls for careful selection of mechanical labor-saving appliances. A New York company uses a crane for lifting out stones in a heavy wire-mesh basket. It is safer than slings and takes less time. The crane is also used for loading dirt direct from excavation to truck.

Some 25 air-compressors are being used to cut pavement, remove foundation, pick, tamp back-fill and drill rock. No rock strata are encountered. Boulders are air-drilled, holes 12 to 15 in. apart, and split with plug and feather. Practically no blasting is done. In winter the rock is heated up with a Houck 4-in. crude oil burner giving a 4-ft. flame served by a 5-gal. air tank. The rock cracks up when water or snow is poured over the heated area. The same burner is used to thaw earth by passing the flame under a pan resembling an inverted coal chute.

Crane loading excavation material

Why Networks Are Used

By D. K. BLAKE

General Electric Company, Schenectady, N. Y.

THE LOW-VOLTAGE alternating-current network having a 115/199-volt or 120/208-volt, four-wire transformer secondary connection and utilizing the low-voltage network protector has been installed by 35 cities in this country. This system gives the most economical supply to load areas where continuity of service is essential to both small and large loads and it is most readily adaptable to take on new loads or increased loads.

IT IS THOUGHT that all distribution systems sooner or later will conform to the network principle and it is desirable that plans for distribution changes take this into account. The network principle also is worthy of study for application to certain industrial plants and large metropolitan buildings. The author of this article outlines the general advantages of the networks and explains the principles used.

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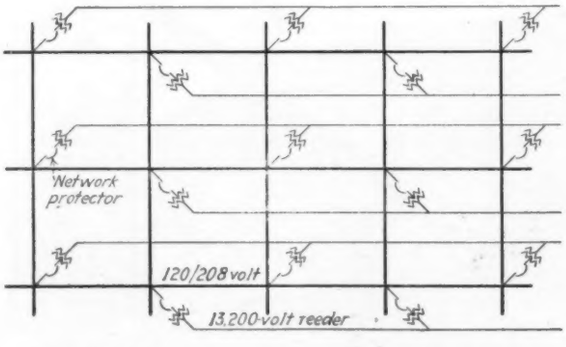
IT HAS not been sufficiently emphasized that the outstanding factor determining the feasibility of the use of the network system is the rate of load growth. If the load is not increasing, then no major changes in the existing system could ordinarily be justified economically. It cannot be too strongly emphasized that the network system is inaugurated primarily because it is the most economical system to take care of the load growth. Sometimes this statement must be qualified to include reliability, but in a large number of cases it actually has a lower cost and at the same time gives greater continuity than other methods now in use.

The chief reason for the economy is the use of higher distribution voltages, which are generally the generated voltage of 11,000, 13,200 and 26,000. By the use of these voltages the cost of the usual distributing substations is saved. Where this cannot be done the network method will have to be justified on the grounds of better continuity even if the cost is somewhat greater than existing methods. It is, of course, true that the simple radial system could be used at the higher voltage (13,200) at a lower cost than the network system, but the reliability would even be inferior to that given by the existing lower voltage (4,000) radial system. If an attemp is made to equal the reliability of the existing system, then the higher voltage radial system cost will in all probability exceed the cost of the network method. The network system gives the same reliability to small loads and large loads alike. Any other type of system could not do this at a comparable cost. Previous distribution methods require that preference be given the large consumer.



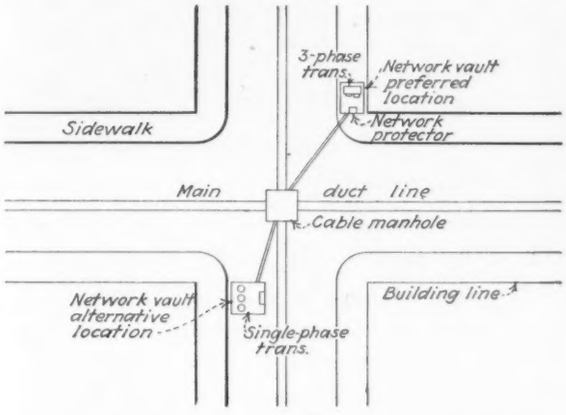
Typical street network system for small distributed loads

New loads, large or small, are quickly and easily connected to the network. With radial secondaries it is very often necessary to check transformer and cable loadings and make expensive changes and rearrangements on account of the addition of the new load overloading present equipment or giving poor voltage regulation. With the network system an individual consumer's load is such a small percentage of the network transformer and copper capacity that it is only necessary to run a set of service cables from the network to the consumer's

switchboard. Transformer loading may be checked at certain intervals and new transformer vaults added to provide for the load growth in a very orderly, efficient and economical manner.

The loads connected to a network system may be divided into two classes, namely, small distributed loads and large concentrated loads. The former are connected to a set of street mains tied together at street intersections. Transformers are connected to the network mains by means of the network protector, there being no high-voltage protective equipment necessary. The transformers and protectors are installed in vaults located under the sidewalks where it is feasible; otherwise they are located under the street.

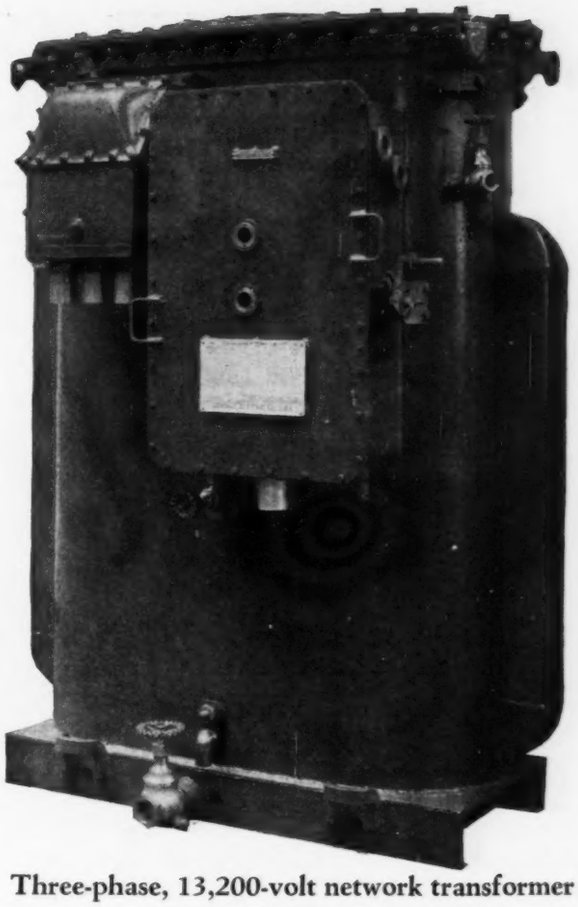
The large concentrated loads are supplied from transformer banks and protectors located on the consumer's premises. Sufficient capacity is installed to permit the removal of a feeder with its transformer without overloading the remaining transformers under peak-load conditions. Where the street mains pass the building the consumer's secondary connection is also made to the street mains.



Preferred and alternative location of network vaults for supply to street mains

Loads that are too large to be supplied from the network mains usually have the transformer vaults located on the consumer's premises. In such cases the network type vault is far superior to other methods for the reason that no high-voltage equipment is necessary. There are just two pieces of equipment to install, a three-phase transformer and a network protector. After they are located in the vault all that remains is to connect the primary cable to the transformer and run the secondary cables from the transformers through the protectors to the secondary bus. A minimum amount of time and work, therefore, is required on the consumer's premises. No elaborate drawings are required because the high-voltage bus and equipment are omitted.

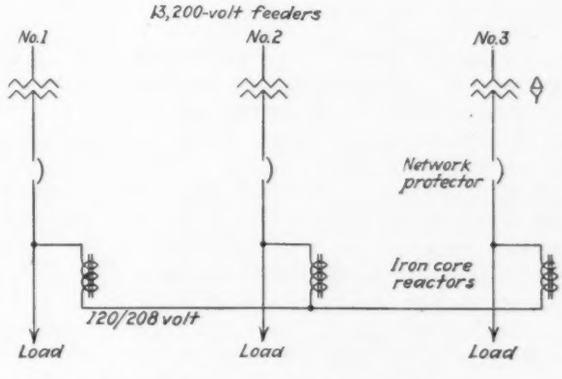
The network system is designed so that at least one feeder with its transformers may be removed from service under peak load without overloading the remaining equipment. This feature is very important to the operating crews, for it allows them to discontinue "live" work and gives them plenty of time for connecting new installations, locating trouble and making repairs.



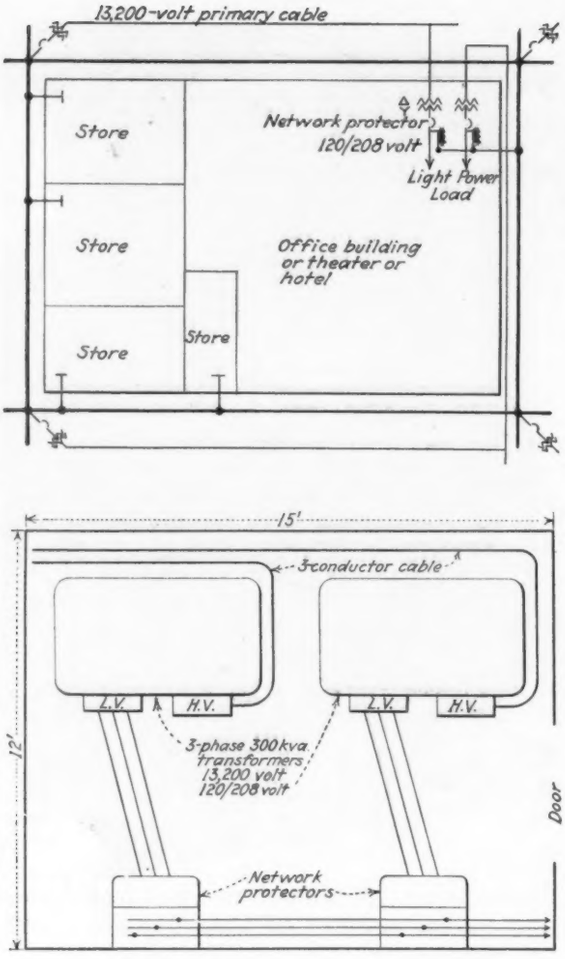
Three-phase, 13,200-volt network transformer

High-voltage pothead on right, low-voltage pothead on left.

There are also several advantages to the consumer in addition to the better continuity he receives. There are such points as simplicity, safety, economy that may be mentioned. The three-phase, four-wire secondary saves in wiring cost and simplifies the balancing of the consumer's lighting load because only four wires are required instead of seven. The omission of the high-volt-

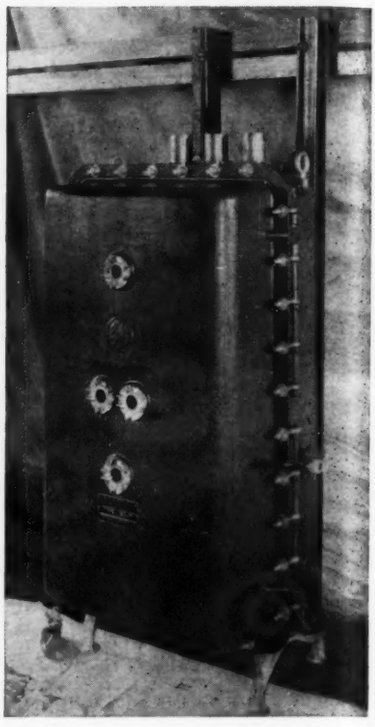


Typical network connections within large buildings



Network vault with equipment, showing simplicity of arrangement

Connecting large and small loads to network



Network protector the key to successful operation

age equipment increases the safety and simplicity, while the floor space is considerably reduced. The value of this floor space to the consumer has not been sufficiently emphasized, for some times it may reach values as high as $300 per square foot.

The paralleling of the large size distribution transformers, together with interconnection of secondary mains, makes it possible for a large percentage of motors to be started directly from the line without starting compensators, thus simplifying and economizing in the control. There is still a net gain even if one or more extra large motors should require increment starters. Even the use of 208-volt supply for 220-volt motors does not need to be to the disadvantage of the consumer, but on the contrary in a large percentage of cases will mean a gain in efficiency. This is due to the fact that a large percentage of motor applications are determined by starting conditions, which means that, after starting, the motor is operating appreciably below full load with lower exciting current and lower losses.

In the small percentage of cases where the use of 208 volts is objectionable or questionable, the autotransformer may be utilized to boost the voltage to 220 volts and still have a substantial gain. It cannot, therefore, be too strongly emphasized that the gain incident to the network system is not only to the benefit of the utility company but to the benefit of the consumer as well, and that in no way does he need to suffer.

If, then, the advantages claimed for the network system are valid, it is very important that a thorough economic comparison for the high load density areas be made without further delay. Such an analysis will show the proper time to start the network system and thereby avoid continuing the existing systems too far, with the resulting economic waste.

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84,665 Man-Days of Safety Steam Plant's Record

AN OUTSTANDING safety record has been set by the working force at the Amsterdam steam station of the New York Power & Light Corporation. Not a single lost-time accident has occurred since August 1, 1925, a period of nearly 4½ years.

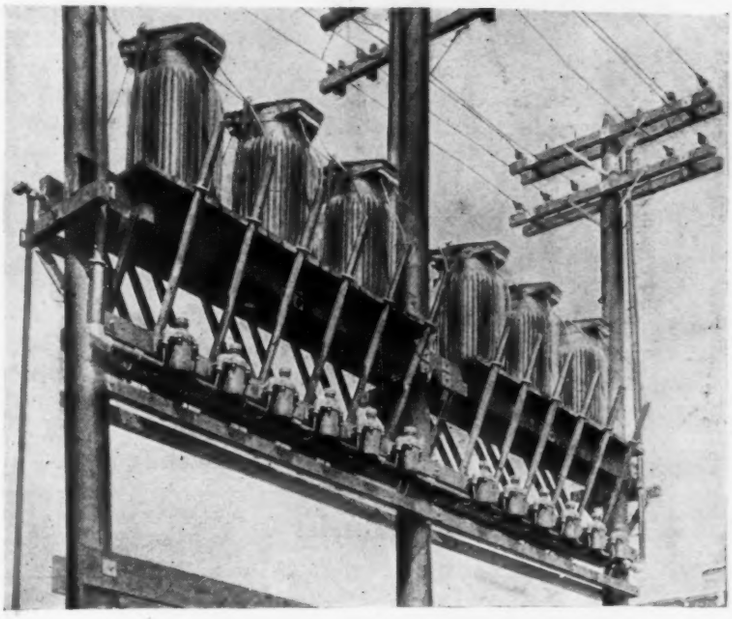
The figures to November 30, 1929, show a clean record for 52 months, or 1,525 working days. This is equivalent to 84,665 man-days, or 683,771 man-hours, that were free from lost-time accidents. Reduced to a one-man accomplishment, this approximates more than 207 years without injury.

During the record period in question the working force at the station has varied from 40 to 100 men. Safe methods have always been stressed in this organization, and each man, when employed, is carefully instructed in safe methods, relative to both himself and his fellow workers. He is carefully trained in the particular work he is to perform. Close supervision and an active and progressive safety committee have also been important factors in establishing this record.

Protecting 2,300-Volt Motors

By B. W. JONES and G. F. LINCKS

Industrial Control Department and Cutout Department, Respectively, General Electric Company



Oil-filled cutouts at transformer bank feeding industrial plant

IN THE EARLY development of electrical apparatus protective devices were generally looked upon as means of protecting the electrical apparatus itself, but at the present time protective devices are chosen with a view of maintaining the continuity of the electrical service and manufacturing processes as well as protecting the industrial equipment.

THE PURPOSE of this article is to show that there are many instances where oil fuse cutouts afford an economical and effective means of attaining these three objectives.

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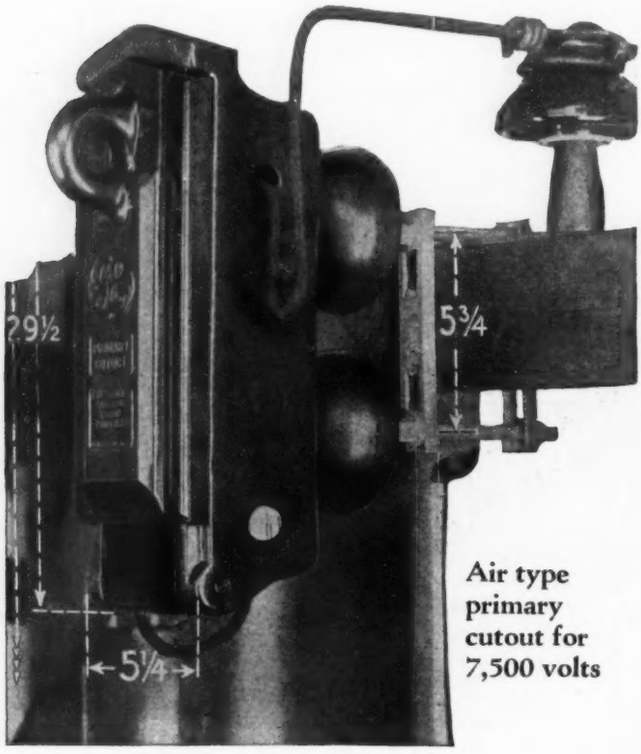
CENTRAL-STATION companies have long realized the value of cutouts. In order to insure continuity of service for both power and lighting, they feel it imperative to confine even infrequent interruptions to the individual industrial plant or the small group of houses fed through the transformer or portion of the system where the fault occurs. Therefore fusible cutouts or breakers are connected in each high-voltage line at every individual transformer installation. Then, should a fault cause a short circuit at any installation, the transformers are immediately disconnected from the distribution system without interrupting the service on any other part of the system. Damage to equipment is also thus minimized. The oil-filled cutout or oil circuit breaker, depending on the size and circumstances, is used on installations feeding important industrial plants. Many industrial plants face the same problems and will be interested in suggested solutions.

Circuit-interrupting devices may be divided into two classes, namely, those designed for the repeated opening and closing of normal or slight overload currents and those designed for opening circuits carrying excessively high currents in an emergency such as a short circuit.

Devices of each class are especially designed to fulfill the requirements of the special protection they are to afford. Control equipment belongs to the first class, as these devices protect the motors from overload, excess heating, over- or under-voltage or any other diversion from normal conditions. Any attempt to provide for the interruption of excessive short circuits with a device of this type complicates the design, increases the size and therefore the cost, and decreases the efficiency of normal operation. It is more economical to install, in addition, a device of the second class, such as a fuse or a breaker calibrated to open only in case of a short circuit, in order to obtain the same quality of service on each individual

motor that is afforded by the central-station company to its individual customers.

It is standard practice on 110- to 600-volt installations of control apparatus and motors drawing 150 amp. or less to install a fuse in each ungrounded line. The use of fuses within their capacity to fulfill the requirements of the second class of circuit-breaking device at the low voltages and also at 2,300 volts and above provides a very economical and effective short-circuit protection to both the service and the equipment. This has been proved by actual service and investigations at the Pittsfield plant of the General Electric Company.



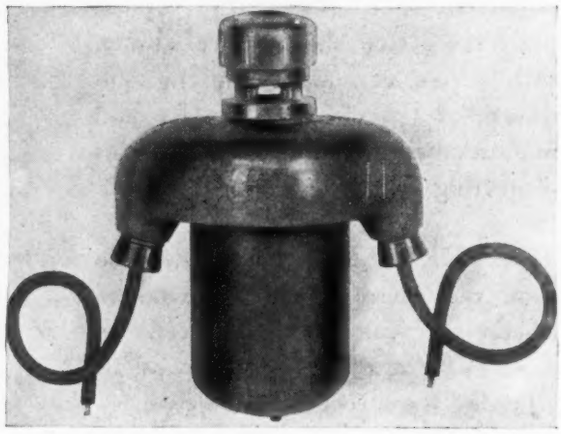
Air type primary cutout for 7,500 volts

The speed of melting of a fuse is of the same order as the melting or burning of the copper wire or parts in the motor or control apparatus, except that the fuse melts at a lower temperature and more rapidly than copper. Therefore, the circuit is interrupted with the least possible damage to the part where the fault occurred. Not only is damage by heating prevented, but abnormal strains caused by excessive currents are headed off, thereby reducing the possibility of immediate or future damage. The speed of operation of the fuse is proportionate to the amount of excessive current, clearing a 60-cycle circuit in as short a time as ½ cycle (0.0083 second) or less, whereas most other devices of the second class require many times as long regardless of the amount of current. Thus, with fuse protection, the possibility of excessive currents causing immediate or future trouble is minimized. In addition to furnishing this type of protection the fuse is the most inexpensive device to install.

Fuses for 2,300- to 7,500-volt systems are mounted in housings specially designed to utilize the forces created by the current and arc which are to be interrupted to aid in clearing the circuit of the fault. These are known as primary cutouts. They may be divided into two types, namely, those breaking the arc in air, and those breaking the arc under oil. In the design of the first type it is not possible to confine the flame, noise and gases, or to protect the fuse links from any corrosive gases which may be in the atmosphere. Thus while this type of cutout is the least expensive and is entirely suitable for outdoor installation, it cannot be recommended for use indoors as a fuse.

In the second type of fuse or cutout the fuse links and arcs are submerged in oil and all of the forces are confined within a metal housing. This makes it an ideal type for indoor installations, even where there are explosive gases, inflammable dust, or oil, or where a corrosive atmosphere might attack the fuse metal so as to reduce the rating and cause unnecessary interruptions to service. In addition, all uninsulated parts which are alive are within the housing. This feature, combined with the simplicity of replacing fuses, makes it safe for electricians and inexperienced operators to replace fuse links, even though they should close the cutout on a short circuit.

The oil-filled type affords very fast, reliable operation on short circuits up to 10,000 r.m.s. amperes, measured in the first cycle of arcing. This, of course, varies with the size of the cutout used. These cutouts are available for 2,300- to 6,600-volt motors up to 250 hp. This limit is based on the use of fuses with ratings which are equal to approximately four times the normal full-load current of the motor so as to permit the control apparatus to function wherever possible within safe operating limits.



Fusible oil-filled primary cutout

The removal of the fuse carrier from the oil-filled cutout provides a visible means for opening the circuit and therefore, in most sections of the country, fulfills the requirement for a disconnecting switch. In certain sections where special rulings demand an air break, the addition of an expulsion cutout of the air type, with a disconnecting blade substituted for the fuse links and holder, affords a low-priced and compact device for this service.

WHY Convertible Issues?

By WALTER N. DURST
Steelman & Birkins, New York

THE financial panorama of the past year has been a fast-moving one. Methods of financing have changed and many new forms of securities have been offered to the investor. In the field of bonds and preferred stocks an increasing use has been made of "privilege" issues—bonds and preferred stocks that are convertible into common stocks, or have warrants attached for the purchase of common stock. The return of easier money rates may help bring back the "straight" or "pure" bond and preferred stock, but many investors will continue to desire issues with a fixed income and senior claim in addition to having a speculative flavor.

Due to the high money rates prevailing during the past year and a half it has been necessary for corporations to make their bond and preferred stock offerings attractive, and at the same time offer these securities at rates that would not reflect disadvantageously on their credit standing and prestige. This has been accomplished by means of "privileged" issues—issues that have some connection with the common stock of the company or possibly some other company which they control.

Approximately one-half of all bonds offered during 1929 were convertible or had warrants attached. The other half represented a few corporation issues, but was largely made up of municipal and government securities. A considerable majority of the preferred stocks have had these privileges attached to them. The problem has, therefore, considerable importance to the investor, and admitting that its importance may diminish, the problem may continue with us for some time.

Benefits to the corporation

The advantage to the corporation of a convertible issue is in obtaining capital at the fixed rate stipulated, and if all goes well the investor will convert his bond or preferred stock into common stock; the corporation will thus eliminate the fixed charges which must be paid on the bond, although increasing the dividends payable on the common stock. From the corporation's viewpoint, it needs the money and can obtain it cheaper by this method than it could by increasing its stock outstanding. The corporation naturally has the advantage as to terms.

A most important question for the investor to ask is, During what period of time can I convert my bond or preferred stock? If ten years is allowed many things may happen and the conversion may prove valuable; if one year is allowed the entire situation should be gone over carefully. An example of a short conversion period is found in the Insull Utility Investment convertible 6 per cent preferred. Each certificate of preferred stock carries a non-detachable stock purchase warrant giving the holder the right to obtain during the year 1931 the number of shares of the company's common stock equal to four-fifths of the number of preferred shares held. This preferred stock is selling at about 87 and the common is selling at about 58. The preferred is thus selling on a true interest basis.

Some convertible issues

Two most popular convertible issues are the American Telephone & Telegraph 4½s of 1939 and the International Telephone & Telegraph 4½s of 1939. The American Telephone 4½s are convertible into the common stock at $180 in 1930, $190 in 1931 and 1932 and $200 from 1933 to 1937. As the common stock is selling at about $218, the convertibles reflect this premium over $180 and are quoted at about $139. The conversion value in 1930 is one factor in determining the market price of the convertible, and the future conversion value adds an additional premium to the market price of the convertible. In the case of these two issues, the length of time is sufficient that the conversion privilege is of present value and may become of greater value.

Engineers Public Service 5½ per cent preferred, quoted at about 98, carries warrants entitling the holder to purchase one share of common stock at $68 per share between November 1, 1929, and November 1, 1938. As the common is quoted at about 40, the warrant privilege is not of present value.

People's Light & Power 5s of 1979 are convertible into the class A stock at $58 per share to January 1, 1932, and thereafter to January 1, 1937, at $65 per share. These convertible debentures are selling at about $75, and with the class A stock at $34, their conversion privilege is of future value, although eight years is a sufficient length of time that the conversion privilege may become valuable.

Other questions are, what is the price of the stock into which I can convert, what has been the past and what is a reasonable outlook for the future for this stock, or, in other words, what is the outlook for the company? If the stock is selling at 50 and a $1,000 bond can be

converted into twenty shares, conversion may be made immediately. If the stock is selling at $50, and a share of $6 or 6 per cent preferred stock is convertible into 2½ shares of common, the preferred is worth $125 on the basis of conversion and will command approximately that price in the market.

Illustrations of this point are the Cities Service Company 5s of 1969. These debentures are quoted at about 103. The debentures carry warrants entitling the holder to purchase 40 shares of common stock from March 1, 1929, through December 1, 1929, at $30.50 per share and on a step-up basis thereafter. As the common is currently quoted at about $30, which is slightly less than the present warrant price, the debentures sell at a slight premium for the future value of the warrants which expire in about 2¼ years.

Many forms of conversion are offered the investor. The simple and easy case is that in which the bond or preferred stock is worth its price without having the conversion or warrant privilege attached. The investor is then almost getting something for nothing, provided the outlook for the corporation is satisfactory. If he pays more than this he is paying for the privilege he receives. It is true that he receives a security prior in lien to the common stock, possibly he receives a first mortgage, but the price above that of its true interest worth will naturally fluctuate with the common stock. A convertible issue or one with warrants that can be purchased for its ordinary price, disregarding these special privileges, is one of the most attractive investments possible. The investor assumes little risk, and if the privilege is good for a sufficient length of time, three years or more, he has a reasonable chance of exercising it. He is then in a fortunate position.

About half of all bonds floated in 1929 were convertible or had warrants attached

Many issues of preferred stock had similar flavoring

High money rates suggested these "privileged" issues. What changes will easier money bring? How will it affect the investor and the corporation?

However, if an investor pays 110 for a bond that is worth 100 without any "sweetening" the most he can lose, unless the stock declines very far, would be the ten points, whereas the stock may decline from 100 to 50. But the more he pays for the conversion privilege the more nearly he is making a stock purchase rather than a bond purchase.

Federal Water Service 5½s of 1954, currently quoted at about $92, are convertible into eighteen shares of class A stock to May 1, 1931, sixteen shares to May 1, 1933, and fourteen shares to May 1, 1935. The conversion into eighteen shares is at about $55 per share, whereas the A stock is selling at about $37. In this case the investor has six years in which to convert, although the bond is later convertible into a smaller number of shares.

The Tri-Utilities Corporation 5s of 1979 are convertible into seventeen shares of the common stock through December 31, 1931, fourteen shares through December 31, 1932, ten shares through December 31, 1934. At seventeen shares the conversion privilege is about $60, whereas the common is now selling at about $45. The bonds are currently quoted at about 89.

The Southern Cities Public Service debenture 6s of 1949 are convertible after November 1, 1929, and prior to November 1, 1934, into the class A stock of Central Public Service Corporation at the rate of 22 shares of class A stock for each $1,000 debenture. A number of illustrations of this type are available in the convertible field; that is, of a bond being convertible into the stock of another company. This bond is currently quoted at about 98½. The conversion price of 22 shares is about 45, whereas Central Public Service class A is selling at about $34.

An illustration of a combination convertible and warrant issue is the Central Public Service convertible debenture 5½s of 1949. They are convertible into the $6 preferred stock at the rate of ten shares for each $1,000 debenture. They also carry non-detachable warrants, entitling the holder to purchase class A stock at the rate of 10 shares for each debenture at $47 through January 31, 1931, etc. These debentures were recently quoted at about 88½, the preferred at about $85 and the class A at about 34. If the holder converts into preferred stock, he obtains ½ per cent greater return, although securing a junior issue, and the market price of the ten shares of preferred would be slightly less than that of his bond. The warrant privilege is not of present value with the A stock at $34.

American Commonwealth Power convertible debenture 6s of 1949 are convertible into class A at $25 per share to May 1, 1932, etc. These debentures are quoted at about 102, with the A stock at 24. The conversion privilege is thus about the same as the price of the stock.

The general features of "warrant" issues are the same. The investor obtains a bond or preferred stock with warrants attached for the purchase of common stock. These warrants may be detachable immediately and, if they have value, may be bought and sold. Or, the corporation may say that they are not detachable for a year and must remain with the bond or preferred stock.

Duration an important factor

The time during which the warrants may be exercised—is it long or short, i.e., one or two years or ten or fifteen—the price of the stock purchasable, the outlook for the corporation and the stock, also the number of shares obtainable, are the questions for the investor to solve. After the warrants have been detached, the bond or preferred stock stands by itself and will fluctuate in accordance with conditions of the money market, etc.

A convertible issue is more nearly a stock offering, while the issue with warrants is more nearly a "straight" issue, as after conversion the holder has only stock, whereas after the warrants are exercised, he still has the bond. The advantage to the corporation of the issues with warrants is that later, upon exercise of the warrants, they receive additional capital. Warrant issues thus tend to favor the corporation, and convertible issues tend to favor the investor.

To Keep Appliances Working

HOW may customers be induced to make full use of appliances? Is it sufficient to keep the devices in good repair or should advertising and education be used to push adequate utilization? Should repairs be made when requested or should a periodic survey of customer's equipment determine its condition? As the result of an analysis of some of the policies and programs of a few outstanding examples of American power companies by ELECTRICAL WORLD strangely divergent views and facts appear.

One organization found that a probable $4,000 revenue increase per service man per year followed the establishment of a customer's appliance inspection service which periodically examines all appliances in the home and reports upon them. Repairs are made free of charge up to a material cost of $1 per repair. For three years this company has found the plan cumulatively advantageous. About 97 per cent of the repairs are made on the customer's premises.

Another leading utility found as the result of 10,500 careful interviews with as many customers that there were but 67 defective appliances reported as such by the owners. This company will repair any appliance upon the customer's request, but decided that a service plan initiating the inspection would be far from justified.

The general sales manager of one well-managed property says that he has "— about come to the conclusion that any appliance which has not sufficient utility to cause the customer to have it repaired can hardly be considered a permanent revenue producer. The most dependable revenue producer in the home today is the electric refrigerator, for this is one device that is so indispensable that it is always kept in repair by the customer, and, judging from reports we get on electric irons and vacuum cleaners, practically all customers will have these devices repaired immediately when they get out of order. There are many other devices, however, such as percolators, toasters, waffle irons, etc., that the customers are negligent about having repaired, for they have convenient substitutes in the home for them."

"I am not inclined to believe that repair service is the 100 per cent answer to the problem," says another. "Our home economics work of educating our consumers how to use their appliances to best advantage is more important. The problem is . . . with the appliances that are in good operating condition but are not used because the consumers do not know how."

Another company which has tried a plan for customer survey service for six years evaluates the results as good will, additional energy sales, appliance prospects, etc., but is unwilling to estimate the exact value of the work.

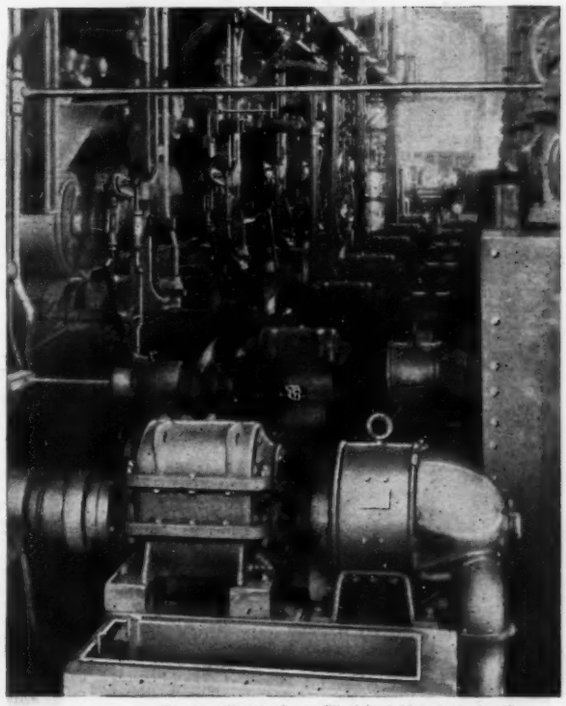
Appliance Use Encouraged by Inspection

Company	A	B	
Service identification	Customer inspection or house-to-house repairs	Customer survey or customer service	District representatives
Employees used	Special, capable of effecting any needed repairs	Special, good personality, age 21-25	Special, trained and selected
Domestic customers per service man....	9,750	12,000	800-1,000
Percentage of repairs done on premises..	97.0*	90.0	Minor repairs only
Interval between calls	No definite interval	18 months	Monthly, with meter readings
Extent of inspection	Check all appliances for OK, repaired, needs repairs, or customer does not want repaired	Complete service survey	Meter reader endeavors to insure complete customer satisfaction regarding service appliances, bills etc.
Expense charged to...	Operating expense	New business	Operating expense
Results judged by....	Kw.-hr. and appliance sales increases	Good will, more kw.-hr. sold appliance prospects	Increased kw.-hr. and appliance sales. Good will
Tangible returns.....	Estimated revenue increase of $4,000 per service man	No determination established	Trouble calls reduced 80 per cent
Plan in effect for.....	3 years	6 years	1½-4 years
Remarks.....		A good will activity but 20,-40-000 lamps are sold yearly by service men. 30 per cent of customers. are out when call is made	See *Electrical World* for Nov. 5, 1927 page 945.

*Labor free and material up to $1 free for home repairs. Labor and material charged for shop repairs.

▼ ▼ ▼

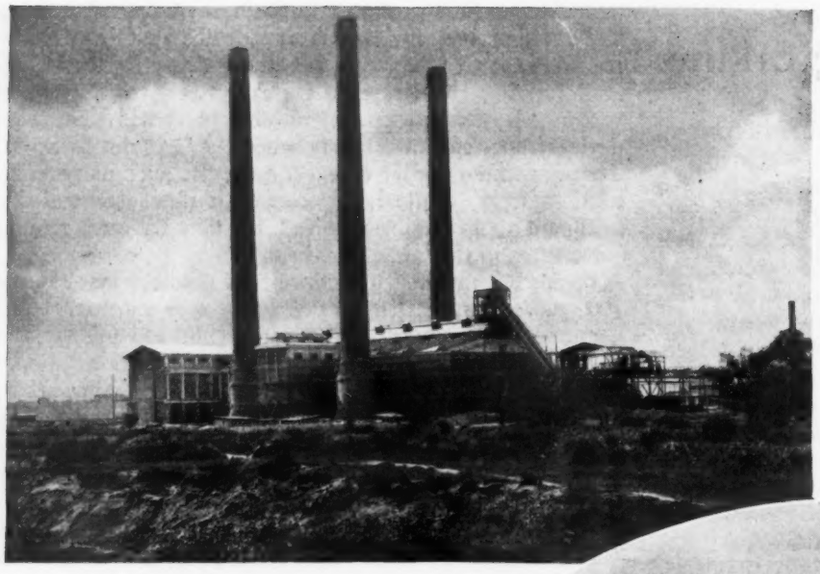
Sectional Drive for Wet End of Paper Machine



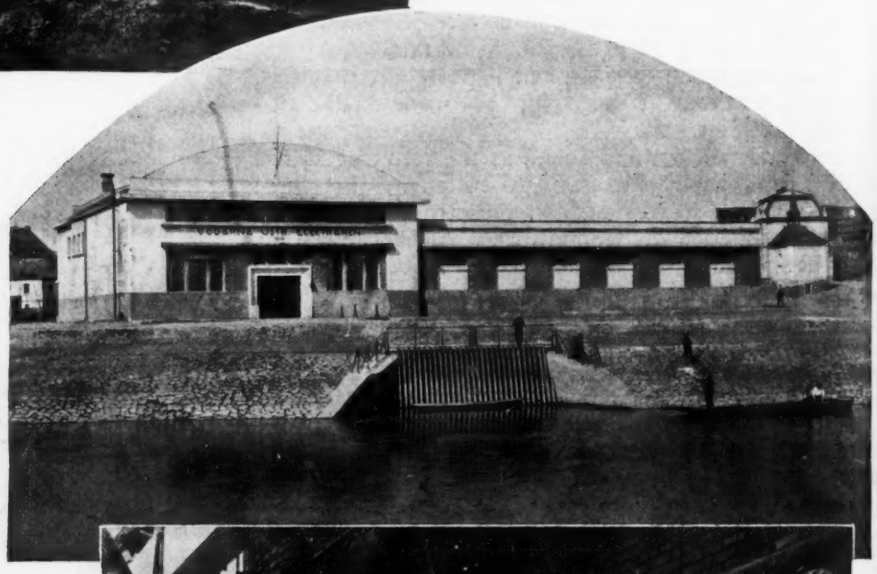
Courtesy Westinghouse Electric & Manufacturing Company

SECTIONAL motor drive for the dry end of a paper machine is customary, but the accompanying illustration shows a new development in that sectional drive is applied to the wet end of the machine. Seven motors are applied to the cylinder molds, but the motors are not regulated by sectional drive control.

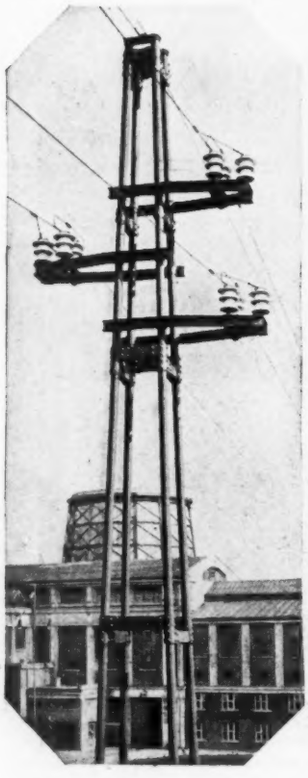
Public Service in Czechoslovakia



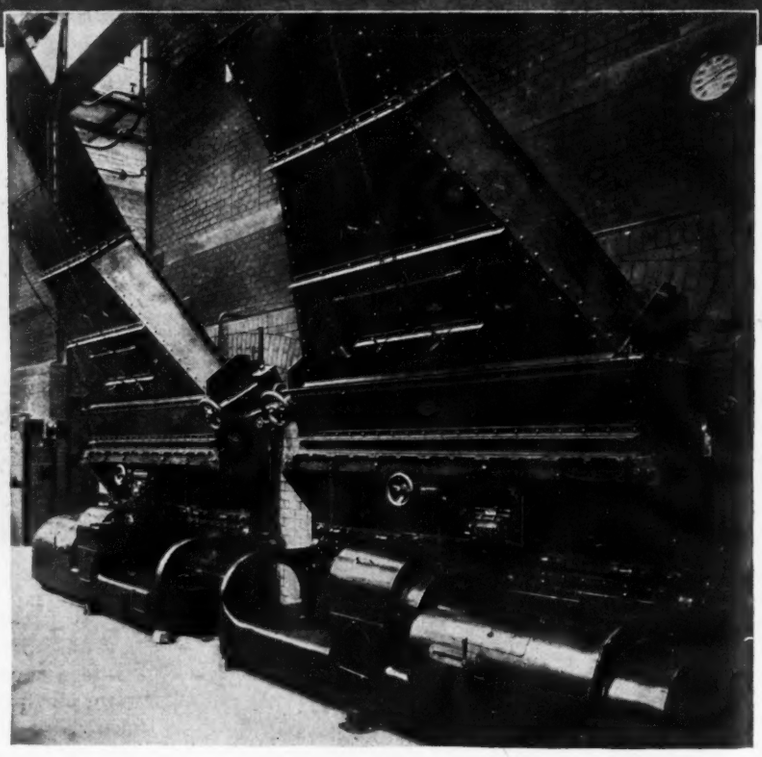
Ervenice power station



Filtration and pumping station for feed water is located 12 miles from the power station. Cooling towers are used at the plant

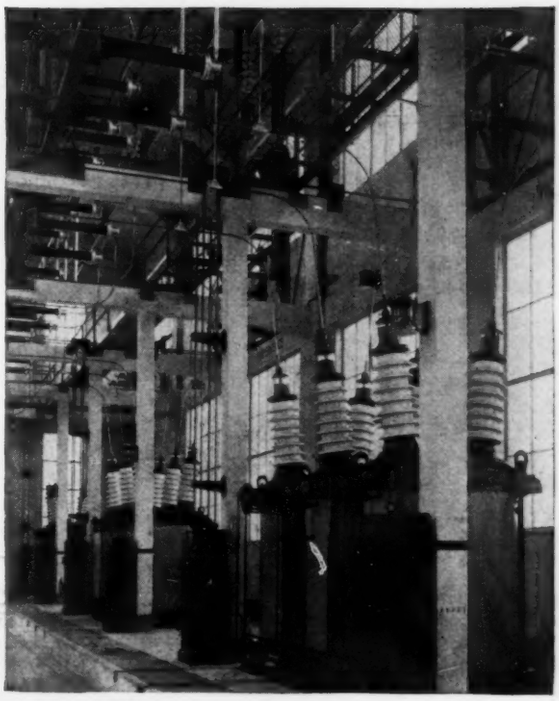


Pipe column structure for a 22-kv. line



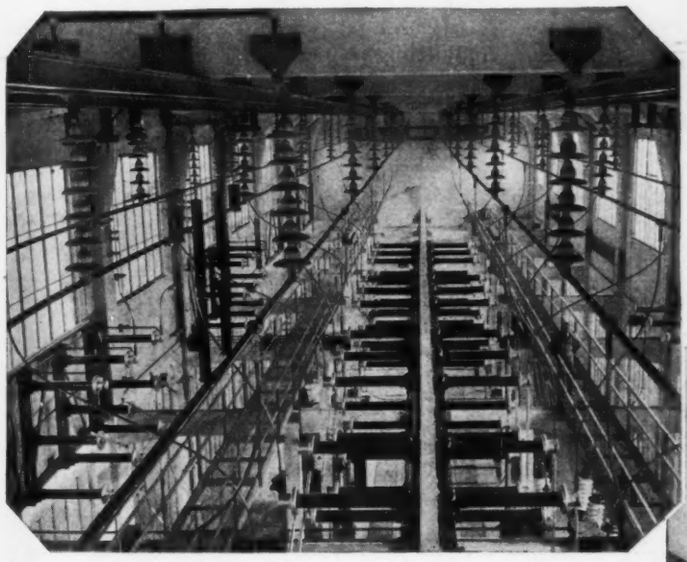
Motor-driven stokers burn mine waste coal that averages 6,000 B.t.u. per lb., 20-25 per cent ash and 20-23 per cent water

WITH liberty there came a great development of electricity in Czechoslovakia. New steam and hydro stations were built and transmission lines of 22,000, 60,000 and 110,000 volts were used to distribute the energy. In the capital city of Prague the past year has brought about a 20 per cent increase in energy use. This city is supplied by a new power station, Ervenice, located at the mines, over 110-kv. transmission lines. It started operation with 90,000 kw. capacity and is designed for an ultimate capacity of 200,000 kw.

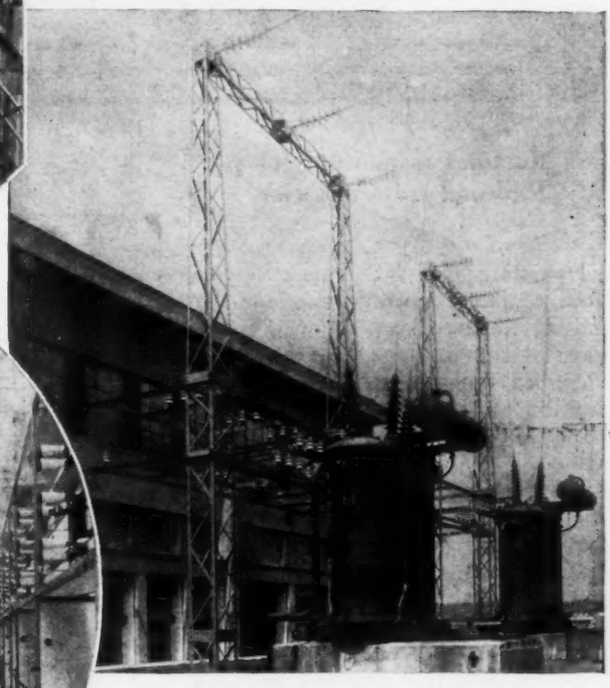


Oil breakers in a Prague substation for 110 kv. are tested at 260 kv.

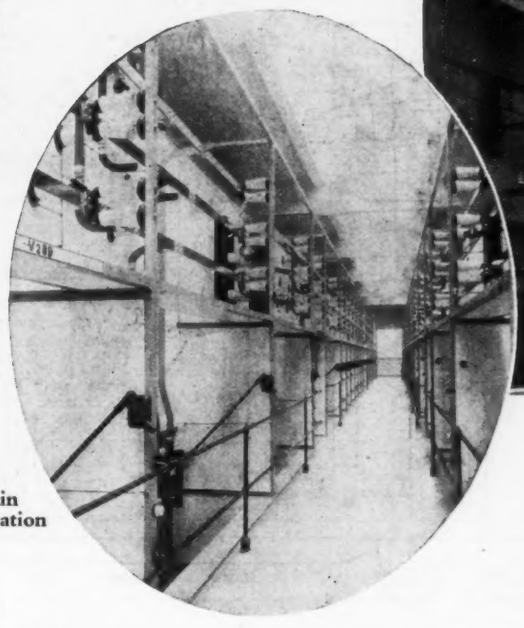
Photos courtesy of Frank Sambera, chief engineer United Generating Company, Prague.



A 110/23-kv. substation in Prague showing the 110-kv. room. Two systems of buses and switches are used. High-frequency test connections are at left



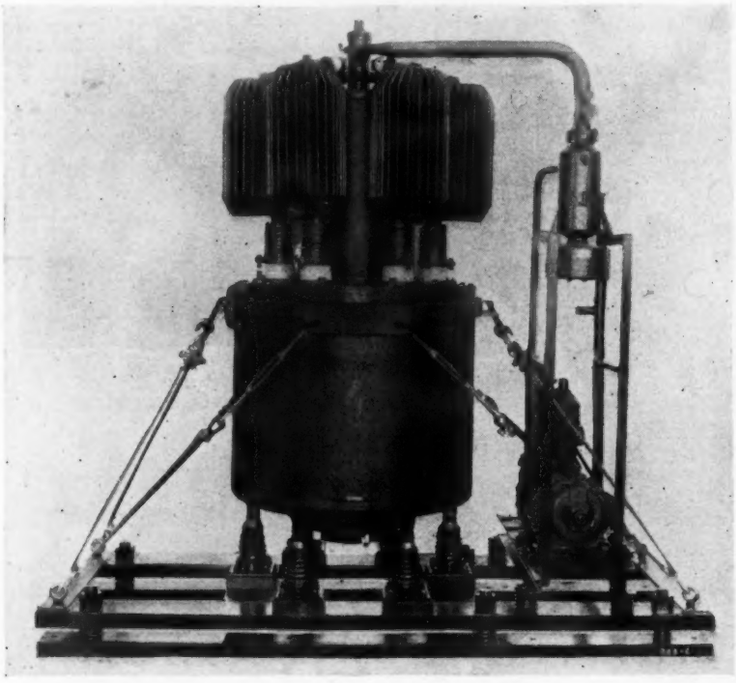
Two 20,000-kva. substation transformers for 110/22-kv. service. Separate coolers are located in the basement with a closed circulation system



Buses and disconnects in a 22-kv. substation

Portable Steel-Inclosed Mercury-Arc Rectifier

WHAT is believed to be the first portable steel-inclosed mercury-arc rectifier substation was placed in operation in Calgary, Alberta, Canada, on May 9, 1929. After a short preliminary run it was returned to the shops of the city of Calgary, the owner, given a final painting and placed in service at a location most advantageous for the handling of the heavy summer traffic to one of the amusement parks in the vicinity of Calgary. From the beginning the rectifier has operated very well and the customer is completely satisfied.



Rectifier mounted for Railroad transportation

The rectifier unit, made by the American Brown Boveri Electric Corporation, is rated at 600 kw., 575 volts, continuous rating. It is fully automatic in every respect and can be operated either continuously or by a time switch. Special provision is made for the elimination of inductive interference with telephone circuits by the installation of a filter equipment.

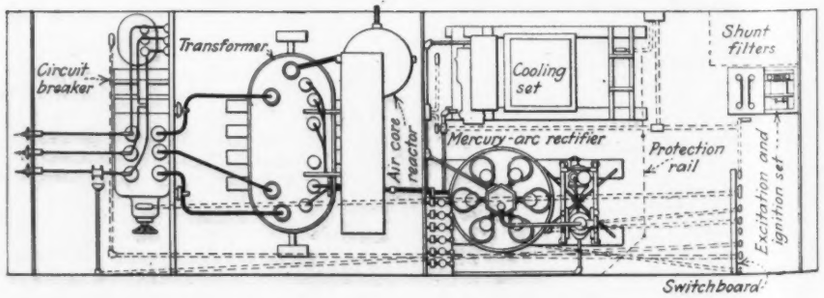
While the electrical features are not unusual, the mounting of the apparatus is quite novel. All equipment is mounted on a railway car and the supporting parts are of special design. In place of the rectifier supporting insulators of the normal type, six busbar supporting insulators are used, while the foundation ring is omitted entirely.

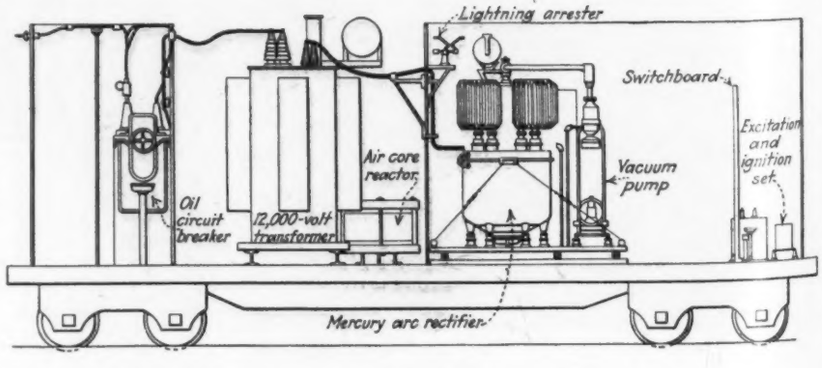
The insulating supports rest on blocks of hard wood. The latter are mounted on a rectangular framework composed of four iron channels and two steel straps; this, in turn, rests on six springs which are fastened to it and to two lower channels by means of heavy bolts. The lower channels are placed directly on the floor of the railway car. In this way the apparatus is allowed sufficient vertical motion to insure an adequate cushioning effect.

Since the speed of the car is never expected to exceed a very low value, any similar effect as a safeguard against horizontal motion is practically unnecessary. Accordingly, eight guy ropes of stranded wire are used, stretched in pairs between four special plates fastened to the rectifier cylinder, and four eye-bolts located singly at the corners of the rectangular supporting framework. These guy wires are removed after the car has been moved to a new location and are put on again when the installation is to be located elsewhere.

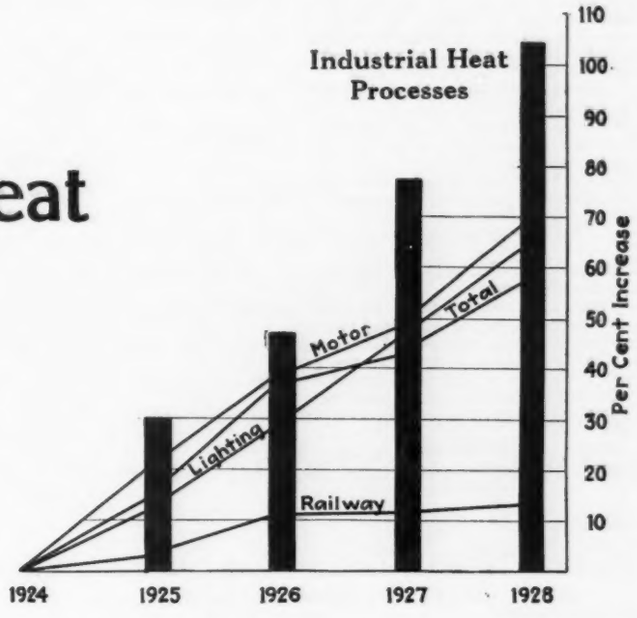
Arrangement of equipment in portable Substation

Only the transformer and the series reactor for preventing inductive interference are located in the open. All the other equipment is of the indoor type and is located in the two covered corrugated sheet-metal housings.





6,000,000,000 Kw.-Hr. for Industrial Heat Processes



Compiled by

N.E.L.A.
INDUSTRIAL HEATING
COMMITTEE

Industrial heating load of fourteen central stations increased 104 per cent in four years. Grows 50 per cent faster than motor load

THE total industrial electric heating load of fourteen central stations is increasing much more rapidly than any other class of load, according to data gathered by the industrial heating committee of the N.E.L.A. for the five years from 1924 to 1928. The utilities supplying this information constitute a representative cross-section of the United States, with an annual kilowatt-hour production of slightly over 15 per cent of the output of the whole industry. Large, medium and small companies are included. One of the largest central stations in the country, which also happens to have the largest industrial electric heating load, has been omitted.

Using this cross-section of industry as a base, the industrial electric heating sales of the public utilities of the United States are estimated to have approximated 6,000,000,000 kw.-hr. in 1929 and produced an annual revenue in excess of $70,000,000.

TABLE I—INDUSTRIAL ELECTRIC HEAT SALES BECOME NEARLY 6 PER CENT OF TOTAL

(Fourteen Companies)

Year	Industrial Heating			Motors			Lighting			Railway			Total	
	Thousand Kw.-Hr.	Per Cent of Total Sales	Per Cent Increase	Thousand Kw.-Hr.	Per Cent of Total Sales	Per Cent Increase	Thousand Kw.-Hr.	Per Cent of Total Sales	Per Cent Increase	Thousand Kw.-Hr.	Per Cent of Total Sales	Per Cent Increase	Thousand Kw.-Hr.	Per Cent Increase
1924	369,328	4.5	....	4,045,763	49.4	....	2,129,483	25.9	....	1,657,378	20.2	....	8,201,952	....
1925	480,392	5.1	30.1	4,870,339	51.6	20.4	2,384,674	25.3	12.0	1,700,669	18.0	2.6	9,436,074	15.0
1926	552,914	5.2	15.1	5,583,190	52.1	14.6	2,748,497	25.6	15.3	1,839,165	17.1	8.1	10,723,766	13.6
1927	657,387	5.7	18.9	5,979,373	51.5	7.1	3,119,197	26.9	13.5	1,853,952	15.9	0.8	11,609,909	8.3
1928	756,436	5.8	15.1	6,841,781	52.7	14.4	3,500,557	27.0	12.2	1,880,615	14.5	1.4	12,979,389	11.8

Table II—Nature of Territory and Load Served by Companies Reporting Heat Sales

Company No.	
1	Industrial and agricultural territory covering wide area with industrial heating load mainly melting and smelting.
2	Very large industrial, commercial and residential city.
3	Concentrated industrial and residential territory, with main industries brass, hardware and products of metal working. Company sells both electricity and gas. Several small cities.
4	Concentrated industrial and residential territory. Company sells both electricity and gas. Large city.
5	Large industrial, residential and agricultural territory, including several small cities, with main industries automobile and foundry. Company sells both electricity and gas.
6	Large industrial city, main industry steel manufacture.
7	Large residential city and suburban area with a wide variety of industries.
8	City of 100,000, having service from two companies; data from one given.
9	Large industrial and residential city. Main industries foundry and machinery manufacturing.
10	Serves a large industrial and residential area, including several large cities. Company sells both electricity and gas.
11	Serves a large industrial and residential area surrounding a very large city. Company sells both electricity and gas.
12	Sales cover only the main industrial district of a large company, with the industrial heating load mainly smelting.
13	Large industrial and residential city. Company sells both electricity and gas.
14	Large industrial and residential city and adjacent territory.
15	Very large industrial and residential city with widely diversified industrial load. Main industry automobile.

Each of the fourteen central stations has provided a statement of its kilowatt-hour sales each year, beginning with 1924, classified into industrial heating, motor, lighting, and railway sales. Sales to other utilities have been omitted. The industrial heating sales are estimates compiled by power engineers and industrial heating engineers as load is added. While the figures may be subject to the criticism that they are not metered, they are believed to be reasonably accurate, because of the experience of the men preparing them. The motor sales are the metered commercial power sales after deduction of the estimated industrial heating sales. Lighting sales are the total metered domestic, commercial and municipal lighting sales. Railway sales include railroads and street railways.

In Table IV are included the sales of company No. 15, whose data became available in 1928, as well as companies Nos. 1 to 14 inclusive, shown for 1924 in Table III. The type of territory and load served by these fifteen companies is indicated in Table II. Table I summarizes the data for all fourteen companies from 1924 to 1928 inclusive.

The industrial electric heating sales of fourteen companies increased from 369,328,000 kw.-hr. in 1924 to 756,436,000 kw.-hr. in 1928—an increase of 104 per

TABLE III—RELATION OF INDUSTRIAL HEAT SALES TO OTHER CLASSES OF BUSINESS IN 1924

Company No.	Industrial Heating: Thousand Kw.-Hr.	Industrial Heating: Per Cent of Total Sales	Motors: Thousand Kw.-Hr.	Motors: Per Cent of Total Sales	Lighting: Thousand Kw.-Hr.	Lighting: Per Cent of Total Sales	Railway: Thousand Kw.-Hr.	Railway: Per Cent of Total Sales	Total Thousand Kw.-Hr.
1	**78,333**	17.0	351,680	76.4	23,661	5.1	6,889	1.5	460,563
2	10,000	0.4	866,945	36.5	664,441	28.0	831,497	35.1	2,372,883
3	36,240	22.6	75,900	47.4	29,235	18.2	18,835	11.8	160,210
4	2,750	0.5	285,000	49.1	122,000	21.0	171,000	29.4	580,750
5	17,500	3.9	252,350	55.6	115,632	25.4	68,701	15.1	454,183
6	59,600	6.3	465,100	49.4	194,500	20.7	222,200	23.6	941,400
7	10,400	2.4	188,600	43.4	227,400	52.3	8,350	1.9	434,750
8	153	0.7	11,850	52.2	10,699	47.1	.....	....	22,702
9	54,168	13.2	149,057	36.3	114,932	28.0	92,194	22.5	410,351
10	8,090	1.1	452,214	63.3	251,853	35.2	2,821	0.4	714,978
11	26,200	7.8	175,723	52.9	81,027	24.3	49,768	15.0	332,718
12	46,580	**30.7**	78,430	51.8	15,930	10.5	10,630	7.0	151,570
13	9,700	3.7	172,550	66.0	79,511	30.4	.....	....	261,761
14	9,614	1.1	520,364	57.6	198,662	22.0	174,493	19.3	903,133
15	No data available	....	.....	....	.....	....	.....	....	.....
Total.....	369,328	4.5	4,045,763	49.4	2,129,483	25.9	1,657,378	20.2	8,201,952

TABLE IV—INDUSTRIAL HEAT BECOMES NEARLY BILLION KW.-HR. OUTLET IN 1928

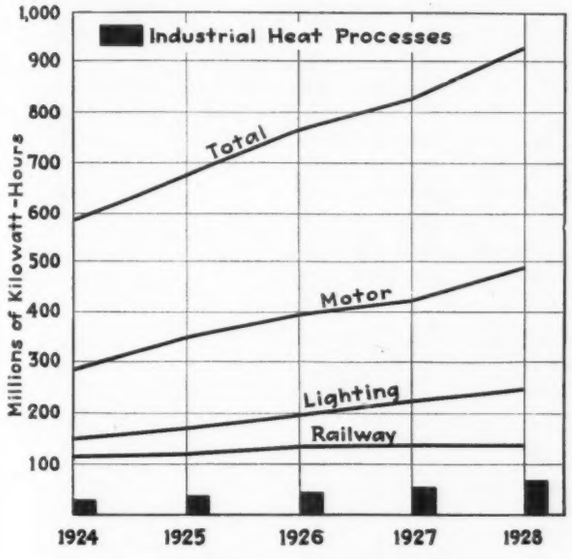
Company No.	Industrial Heating: Thousand Kw.-Hr.	Industrial Heating: Per Cent of Total Sales	Industrial Heating: Per Cent Increase in Four Years	Motors: Thousand Kw.-Hr.	Motors: Per Cent of Total Sales	Motors: Per Cent Increase in Four Years	Lighting: Thousand Kw.-Hr.	Lighting: Per Cent of Total Sales	Lighting: Per Cent Increase in Four Years	Railway: Thousand Kw.-Hr.	Railway: Per Cent of Total Sales	Railway: Per Cent Increase in Four Years	Total: Thousand Kw.-Hr.	Total: Per Cent Increase in Four Years
1	124,068	16.5	58.2	556,539	73.7	58.0	65,282	8.6	176.0	9,061	1.2	31.5	754,950	64.0†
2	19,271	0.6	92.7	1,560,886	45.1	80.0	956,621	27.6	44.0	927,534	26.7	11.6	3,464,312	46.0
3	63,695	19.4	75.6	151,663	46.3	99.6	65,736	20.1	125.0	46,440	14.2	147.0	327,534	104.4
4	13,600	1.8	395.0	371,000	50.4	30.1	202,000	27.4	65.6	150,000	20.4	12.3‡	736,600	26.8
5	45,730	5.3	161.0	532,426	62.5	111.5	218,384	25.6	88.8	55,895	6.6	18.6‡	852,435	87.6
6	98,000	7.9	64.3	620,500	50.0	33.3	311,600	25.1	60.2	210,500	17.0	5.3‡	1,240,600	31.8
7	32,800	4.6	216.0	311,000	43.9	65.0	360,900	51.0	58.7	3,760	0.5	55.0‡	708,460	63.0
8	2,837	7.3	**1,750.0**	18,115	46.9	52.8	17,714	45.8	65.6	.....	.....	.....	38,666	70.2
9	146,200	20.7	170.0	228,960	32.3	53.5	208,645	29.5	81.6	124,057	17.5	34.6	707,862	72.5
10	25,500	1.9	216.0	832,699	61.1	84.0	468,158	34.3	85.9	37,322	2.7	1,244.0	1,363,679	90.8
11	51,500	8.3	96.7	318,937	50.9	81.2	164,689	26.5	103.0	88,756	14.3	78.3	623,882	87.5
12	63,000	**29.8**	35.2	116,000	54.8	47.8	21,500	10.1	35.0	11,250	5.3	5.8	211,750	39.7
13	39,000	7.8	301.0	270,000	54.3	56.1	120,000	24.2	50.9	68,000	13.7	100.0	497,000	90.0
14	31,235	2.1	223.0	953,056	65.7	83.0	319,328	22.0	60.7	148,040	10.2	15.2†	1,451,659	50.8
15	**165,560**	8.4	*	1,068,715	54.0	*	598,807	30.3	*	143,570	7.3	*	1,976,652	*
Total....	**921,996**	6.2	**104.5**†	7,910,496	52.8	69.1†	4,099,364	27.4	64.4†	2,024,185	13.6	13.5†	14,956,041	58.2†
Average Increase per year			**26.1**			17.5			16.1			3.4		14.5

* Not available. †Includes only companies No. 1 to No. 14 inclusive. ‡Decrease.

cent. During this period motor sales increased 69 per cent, lighting sales 64 per cent, railway sales 13 per cent and total sales 58 per cent. Not only have industrial heating sales increased rapidly but their ratio to total sales has risen from 4.5 per cent in 1924 to 5.8 per cent in 1928. During this period the motor load only increased from 49.4 per cent of total sales in 1924 to 52.7 per cent in 1928, a comparatively small proportionate change. Lighting also had a slight increase in its ratio to total load from 25.9 per cent in 1924 to 27 per cent in 1928. Railway sales decreased from 20.2 per cent of total sales in 1924 to 14.5 per cent in 1928.

Growth of classified loads

The growth of classified loads in individual companies can be studied from Tables III and IV. The growth of an average company is shown in the graph below, representing the average of fourteen companies with 1928 industrial heating sales equal to 5.8 per cent of the



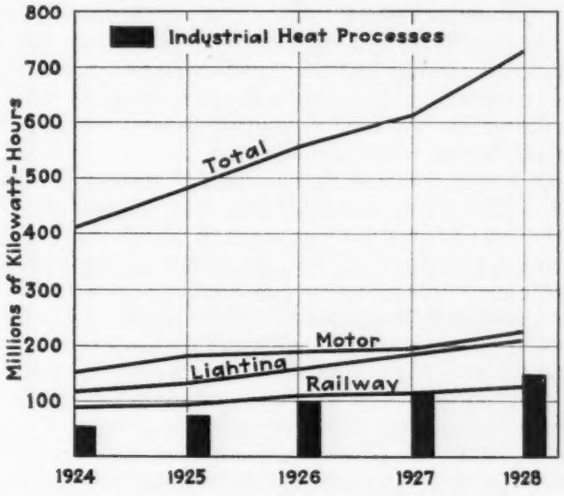
Four-year sales growth of fourteen utilities

Industrial heat attains 10 per cent of industrial power sales

total. A four-year sales history of company No. 9, having industrial heating sales amounting to 20.7 per cent of total sales, is graphically presented in the next column. This company has the highest percentage of total sales in industrial heating of all companies studied, except company No. 12, for which the data include only the main industrial district. All other companies submitted complete figures.

Company No. 9 had sales of 146,200,000 kw.-hr. in 1928, an increase of 170 per cent in four years from the large heating load of 54,168,800 kw.-hr. in 1924. Companies Nos. 4, 7, 8, 10, 13 and 14 had still larger increases from much smaller loads in 1924. The industrial heating sales of company No. 9 had the higher ratio to commercial power sales—39 per cent in 1928. The largest company, No. 2, has the lowest ratio of industrial heating sales to total sales—0.6 per cent in 1928.

From 1924 to 1928 industrial electric heating sales increased more rapidly in the six combination gas and electric companies, Nos. 3, 4, 5, 10, 11 and 13, than in the eight purely electric companies. Sales for industrial heating in these six companies increased 135 per cent from 100,480,000 kw.-hr. in 1924 to 239,025,000 kw.-hr.



Sales growth of company selling 21 per cent of output for industrial heat

.n 1928. During this same period sales for industrial electric heating of the straight electric companies increased 92 per cent from 268,848,000 kw.-hr. in 1924 to 517,411,000 kw.-hr. in 1928. The ratio of industrial electric heating sales to total sales of the combination companies increased from 4.1 per cent in 1924 to 5.4 per cent in 1928.

The future

Industrial electric heating sales have had an average yearly increase of 19 per cent for the past four years. Every indication points to a continuation of the present trend. This rapid increase is due to the fact that industry understands to a greater extent than ever before that a comparison of costs of sources of heat on a thermal basis means nothing without a complete investigation of over-all cost (the only figure that results in profit or loss), that profit or loss does not necessarily result from individual process economy, and that the source of heat best suited to one operation may not fit another.

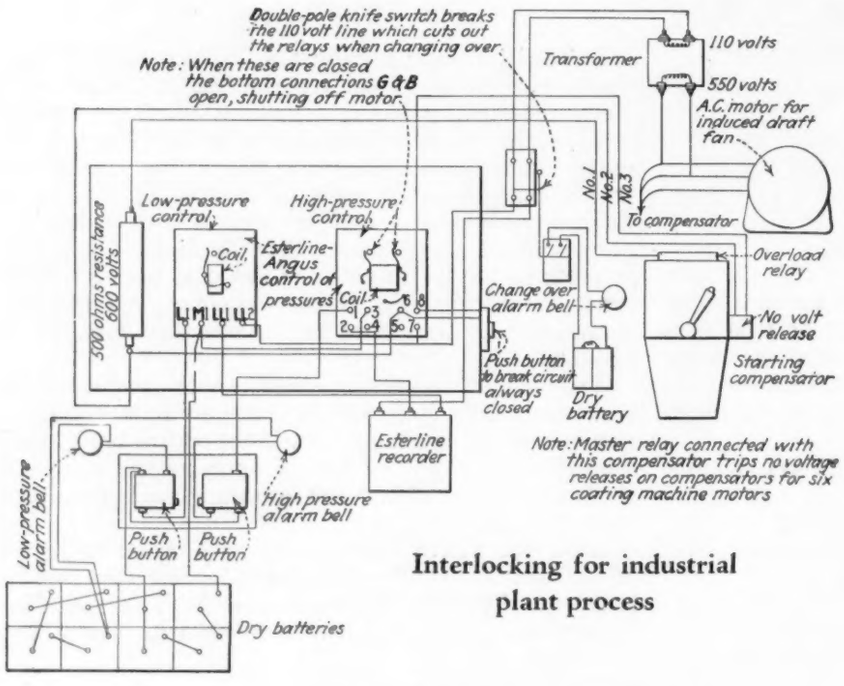
The use of electric heating under suitable local economic conditions would be much accelerated and result in large savings to industry if the central station gave industry the service it needs in applying this comparatively new source of heat and in making investigations of over-all costs.

Since the fifteen central stations referred to herein have estimated that their industrial heating sales will be well over 1,000,000,000 kw.-hr. in 1929, not only industry but every central station should *Investigate Electric Heat.*

Automatic Protection of Industrial Process

FOR THE safety of employees and the protection of plant equipment it is essential that the apparatus used for the withdrawal and collection of fumes arising from the steam-operated driers for the coating machines in the "Fabrikoid" plant of E. I. du Pont de Nemours & Company, Inc., at Newburgh, N. Y., be carefully controlled, interlocked and arranged so that a shut-down at the condensing end will not only give an alarm but stop feed-in processes. A protective system with several unusual features has been devised.

The gases released in the drying process are withdrawn from the steam tables through exhaust ducts by induced draft fans and delivered to the activated carbon system. It is essential that both low- and high-pressure conditions be fully protected and that the motors driving the coating machines be stopped as soon as any interruption takes place in the activated carbon process. The accompanying illustration shows the layout which is used for this purpose and involves: simultaneous shutdown of each coating machine motor through a Cutler-Hammer master relay, which in turn actuates the low-voltage release on the individual motor starting compensators; protection for the alternating-current blower motor in the event of high pressure in the receiver; signal bells which indicate the completion of the filling of one of the two receivers for collected and condensed gases or excess pressure in the exhaust ducts, and an alarm bell which indicates when the switch cutting out the automatic protection is open. According to E. C. Maloney, plant engineer, this protective equipment acts satisfactorily under all conditions and solves a problem which formerly caused severe operating difficulties. An Esterline-Angus graphic instrument controls the pressure operations in connection with the exhaust fume collection.


Double-pole knife switch breaks the 110 volt line which cuts out the relays when changing over
Note: When these are closed the bottom connections G & B open, shutting off motor.
Transformer
110 volts
550 volts
A.C. motor for induced draft fan
No.1
No.2
No.3
To compensator
Low-pressure control
High-pressure control
500 ohms resistance 600 volts
Coil
Esterline-Angus control of pressures
Coil
Overload relay
Change over alarm bell
No volt release
Push button to break circuit always closed
Dry battery
Starting compensator
Esterline recorder
Note: Master relay connected with this compensator trips no voltage releases on compensators for six coating machine motors
Low-pressure alarm bell
High pressure alarm bell
Push button
Push button
Dry batteries

Interlocking for industrial plant process

▼ ▼ ▼

Recuperative Bread Baking Shows Economies

RECENT experiences with electric ovens for the baking of bread and cakes in Germany and Austria indicate that the only economical type of oven is the recuperative or heat-storage type, in which a mass of reinforced concrete is charged during the night hours. This is usually accomplished from 10 p. m. until 5 a.m., reaching a temperature of about 340 deg. C. From 5 a.m. until 4 p.m. the stored heat is given off for use in three baking shifts. At the end of the charging period the oven has a temperature of about 290 deg., dropping to 220 deg. at the end of the final bake.

According to a recent discussion of this subject in the November 15, 1929, issue of *Elektrotechnik und Maschinenbau* the customary size of such an oven is that with a baking surface of about 75 sq.ft., capable of handling about 900 lb. daily, and calling for a charging energy of 180 kw.-hr. Considering losses over week-ends and forced operation previous to holidays, a yearly consumption of 62,500 kw.-hr. is given as a normal expectancy. This represents about 2,100 hours of night load.

Records indicate that approximately 50 per cent of the applied heating energy is utilized in actual baking, 30 per cent is lost as radiation from the ovens and 20 per cent is represented by unavoidable losses due to charging door and flue factors. Average power consumption for 220 lb. of bake is stated as, white bread, 45 to 55 kw.-hr.; rye bread, 35 to 45 kw.-hr., and rolls, 38 kw.-hr. Gas and coal-fired ovens are the chief competitors of the electric type. A gas oven will require an average of 560 cu.ft. of gas per 220 lb. of bake. A steam type will require 76 lb. of soft coal for comparable results. At a cost of 70 cents per thousand cubic feet of gas and 1 cent per kilowatt-hour (night rate) gas and electric operations are virtually on an equal basis. Steam heat cannot be directly compared, as there are several other items which would have to be taken into consideration. In fancy baking electricity is particularly in favor, since the baking cost is often as much as 1.68 per cent of the price asked, and results are exceedingly important.

The first cost and the installation of all three types of ovens are about the same, while depreciation and repair costs on electrically heated ovens are much lower. On the majority of the installed heat storage ovens neither maintenance nor repair bills came in for a period of five or more years.

We Haven't Begun to Light!

An endeavor to establish the saturation lighting load of the United States indicates that but 13 per cent of the potential market has been tapped. Physiological, use and census elements combined

FOUNDED as a lighting business, and with a probable 25 per cent of today's total energy sales to the public devoted to such a load, and 50 to 60 per cent of its revenue received from lighting, the electric light and power industry should in self-interest have a full knowledge of illumination factors and lighting load saturation. Yet today, 50 years after the lighting of the first electric lamp, it is difficult to find a handful of scientific men who will agree upon desirable intensities that will approach the ultimate for various duties, or public service representatives who will push adequate installations for home, office, highway and factory. Why must America struggle in nerve-wracking half-gloom? Why is industry crippled by unsure fingers? Why are homes lighted in spots instead of uniformly? Here is a "publicity," "understanding" and "sales" opportunity that makes the usual public relations twaddle seem an empty gesture. The expansion and sales possibilities in a situation where a consuming saturation of but 13 per cent is involved are staggering.

How much light is desirable in view of the best of today's knowledge of physiological needs and economics? What is the saturation point for the use of electrical energy for lighting?* Two sets of quite different statistical data are necessary to answer these questions: First is the decision as to the brightness of light in foot-candles or similar units which it is necessary or desirable that the average human being should have for different kinds

**Most of the data in this discussion were presented by Arthur E. Allen, Westinghouse Lamp Company; E. E. Free, consulting engineer, and Frank W. Smith, United Electric Light & Power Company, at a recent meeting of the New York section of the American Institute of Electrical Engineers, held at the Westinghouse Lighting Institute.*

PRINTING PLANTS NEED ADEQUATE LIGHT

of work. Second is the exceedingly complicated statistical picture of the number of hours which each American spends on the annual average in the kinds of work requiring these levels of illumination.

If a statistical entity of an average family is assumed the daily activities of this entity may then be divided, so far as artificial light is concerned, into three groups: (1) *Work illumination:* reading, writing, sewing, kitchen work, office work, skilled factory work, salesrooms in stores, etc. (2) *Social illumination:* eating, dressing and undressing, social activities at home, office reception rooms, unskilled factory work, places of public assembly such as hotel lobbies, etc. (3) *Utility illumination:* halls and passages in homes, storage rooms and warehouses, factory yards and passages, city streets, etc.

Criteria for these classifications are: (1) The amount of light sufficient for rapid and accurate reading of ordinary newspaper type (7 point) at the usual reading distance of approximately 18 in. and without notable eye strain on the normal eye; (2) conversational lighting level, the amount of light necessary to recognize without difficulty the facial expression of another person at a distance of 10 to 15 ft., this is approximately equivalent to the light necessary to recognize the faces and spots of playing cards with ease at the average distance of a table top from the player's eye; (3) the lighting level necessary for recognition of the identity of a reasonably familiar person at a distance of 15 to 20 ft.

Lighting levels necessary to produce these three degrees of effective illumination have been computed, taking into account four different grades of lighting, ranging from the lowest levels believed permissible for good practice up to the highest which conceivably might be advisable. These may be specified as (1) *Minimum "good practice"* according to present lighting standards and ideas. (2) *The minimum level recommended under existing economic conditions* and taking into account both present-day lighting engineering and the physiologic characters of the human eye. (3) *The level of the greatest economic advantage;* that is, the lighting level beyond which further increases in light probably would not produce increases in health or efficiency consonant with the increased cost, the economist's "point of diminishing returns." (4) The *maximum level* desirable from considerations of eye physiology only, without reference to economic considerations or to engineering practicability.

Tests under actual operating conditions undoubtedly would be the best method of fixing lighting levels were sufficient information available. However, there seems never to have been made any thoroughly satisfactory

ASSUMED LIGHTING LEVELS FOR GOOD SEEING

Ruling Activity	Illumination in Foot-Candles		
	Work	Social	Utility
Minimum "good practice" at present	15	5	3
Minimum recommended levels	30	10	5
Probable levels of greatest economic advantage	50	15	5
Possible desirable levels from eye considerations only	300	50	30

comparative test between various illumination levels high enough to have much meaning. Comparison of indoor with outdoor daylight levels under which the eye is supposed to have evolved offers a highly desirable method of attacking the problem could one be certain of the precise conditions of human evolution in the past and of the degree, if any, to which modern life has altered eye characteristics. Full sunlight probably averages about 10,000 foot-candles. Ordinary outdoor illumination, in the shade, averages between 500 and 1,500 foot-candles, depending on the weather. It is probable that primitive man never did any eye work except in levels of illumination well above 100 foot-candles; 500 foot-candles may have been a reasonable average for the evolution of skill at close eye work such as the manufacture of stone weapons. Man's eye probably has been developed for accurate seeing under illumination levels between 100 and 500 foot-candles.

Ideal illumination for best seeing certainly is not under 30 foot-candles. Probably it is over 100 foot-candles. The prescription of illumination level for the most accurate and easiest seeing would be approximately 300 foot-candles for any kind of fine work. Based on the facts outlined, the twelve separate levels of illumination for the three types of human activity and the four illumination grades may be assumed as shown in the accompanying table.

The Average Family—Quite different meanings are applied in different statistical tabulations to the word "family." For present purposes it seems fairer to include all persons in the United States in the family computation, dividing these persons into hypothetical average families in accordance with the total number of such families.

To provide some idea of the number of such families basic data are available, and taking all these into account the present total number of families in the United States is probably about 26,000,000. The total population of the continental United States at present is approximately 122,000,000 individuals. Dividing this by the above assumed number of families gives, for the statistical average family, 4.69 persons. The 4.69 persons in the statistical average family may be distributed in accordance with four percentages derived from census data (1920) as given in the accompanying table.

Classes of Persons in the Average Family

	Per Cent of Total Population (or of Family)	Number of Persons in Average Family
Infants (under 5 years)	10.9	0.51
School children (5-14 years)	20.9	0.98
Working adults	40.0	1.88
Housewives	28.1	1.32
Total	99.9	4.69

The next step is the computation of the needs of the average family for hours of artificial light per day, dividing this computation into the three grades of illumination, "work," "social" and "utility," as above referred to. The basic assumption is that each individual, whether in his or her working place or merely moving about the house, office or city, is supposed to be provided with an area of illumination sufficient for the occupation being followed at that moment.

In computing the figures account has been taken of

GOOD LIGHTING FOR OFFICES PAYS IN MANY WAYS

the variations of daylight in different parts of the United States for different months of the year and also, so far as possible, of lost daylight in cities due to smoke and close building.

This distribution of activities and needed light-hours may now be applied to the total number of families in the United States able to use electric light. A conservative figure for the number of wired homes in the United States is 16,000,000. In general, it has been assumed that persons living in wired homes are also working in factories and offices supplied with electric light. For considerations of saturation, account should be taken of homes which ought to be wired rather than of those which are wired. The total number of dwellings in the United States was assumed above as 22,800,000. Considering 16,000,000 of these dwellings as wired, this means the present electrification of approximately 70 per cent of the country's dwelling houses. Applying this percentage to the number of families above assumed, approximately 18,000,000 of these families may be considered as at present within reach of the use of electric light. To allow for extensions of electric service which are reasonable and economically justifiable, it probably is reasonable to assume a saturation figure of 20,000,000 average families, as above defined, reachable by electric current for lighting purposes. On this basis the light-hours needed in the continental United States, based upon the preceding assumptions and computations, would be as shown in the accompanying table.

Light Needs in Kilowatt-Hours—The first step in translating these figures from light-hour needs into needs of electricity is the translation from foot-candles into lumens and thence into watts. In theory, it might be sufficient to illuminate only the article looked at; for example, a book under a reading lamp. On this basis relatively few lumens would be required to produce even 100 foot-candles. However, the relatively high levels of illumination which the human eye apparently needs cannot be provided satisfactorily without close attention also to the matter of glare. It is probable that future lighting practice will insist more and more on a reasonably even level of illumination for the entire interior of working rooms, offices and rooms for reading or other close work at home.

For work illumination a fair average of floor space (which is the same as working-level space) in homes and offices is probably about 60 sq.ft. per individual, which means four persons in a room 15 ft. square. Taking the usual rule of doubling the needed lumens to compute the generated lumens, this means the necessary emission of 120 lumens on the average for each foot-candle of illumination at the level here referred to as work illumination.

For social illumination, while the lighting level is lower the area which must be illuminated is greater, since one or two persons frequently occupy a room large enough for eight or ten. Probably an average illuminated area of 150 sq.ft. per person is a reasonable assumption for this group of human activities; covering an allowance, also, for the considerable percentage of such rooms left illuminated at this intermediate level while no one is in them. On the same assumption as before, this would mean 300 emitted lumens for each useful foot-candle.

For utility illumination the area to be illuminated is again larger and a still larger allowance must be made for rooms, like halls and passageways, which should be illuminated almost continuously even if not occupied; 400 sq.ft. of illuminated area per person does not seem an excessive allowance; account being taken of the necessity that no dim, unlit corners be left as accident hazards in factories and under similar circumstances. This would equal 800 emitted lumens for each useful foot-candle.

Light-Hour Needs of Individual Members of Average Family

	Daily Person-Hours		
	Work Illumination	Social Illumination	Utility Illumination
Infants			
Bedrooms, etc.	....	1.00	....
School children			
Homework and reading	1.50	....	....
Meals and social	....	2.00	1.00
In school	0.50	0.50	1.00
	2.00	2.50	2.00
Working adults			
Dressing and undressing	....	0.50	....
Work	2.00	3.00	3.00
Meals and social	....	2.00	5.00
Home reading	0.50	....	....
	2.50	5.50	8.00
Housewives			
Dressing and undressing	....	0.50	....
Work	3.00	2.00	3.00
Meals and social	....	2.00	5.00
Home reading	0.50	....	....
	3.50	4.50	8.00

A Summary of Light-Hour Needs of Average Family

	Persons in Family	Total Daily Person-Hours		
		Work Illumination	Social Illumination	Utility Illumination
Infants	0.51	....	0.51	....
School children	0.98	1.96	2.55	1.96
Working adults	1.88	4.70	10.34	15.04
Housewives	1.32	4.62	5.94	10.56
	4.69	11.28	19.34	27.56

Light-Hours Necessary for United States

	Work Illumination	Social Illumination	Utility Illumination
Daily hours per family	11.48	19.34	27.56
Daily hours per 20,000,000 families	229,600,000	386,800,000	551,200,000
Annual hours per 20,000,000 families, 365 days	83,700,000,000	141,000,000,000	201,600,000,000

LIGHT NEEDS OF THE UNITED STATES

Ruling Activity	Millions of Kilowatt-Hours per Year			
	Work	Social	Utility	Total
Minimum good practice at present	11,800	16,490	37,800	66,090
Minimum recommended levels	23,600	32,390	63,000	118,990
Probable level of greatest economic advantage	39,410	49,470	63,000	151,880
Possible desirable levels from eye consideration only	236,000	164,900	378,000	778,900

These values now may be converted into electrical energy by the factor of 12.8 lumens per watt, given in the report for 1928-29 of the lamp committee of the National Electric Light Association. The results are, for work illumination, 9.4 watts per foot-candle; for social illumination, 23.4 watts per foot-candle; for utility illumination, 62.5 watts per foot-candle.

Using these figures it is now possible to combine the table of lighting levels for good seeing, that of light-hours necessary, and the figures just given to compute the country's needs of light, in kilowatt-hours per year, on the different bases of illumination and of human activity specified in the table of lighting levels. The results of this computation, in millions of kilowatt-hours per year, are given in the accompanying table.

Saturation—To compute the percentage of saturation of the United States, the present use of electric energy for light must be established. The latest figures giving actual sale of electric energy for the production of light are those of the census of manufactures of 1922. At that time the sale of energy for light was 9,982,676,000 kw.-hr. per year. This has notably increased since 1922.

One way of computing the increase is from figures prepared annually by the Federal Power Commission and giving the total electricity generated for all purposes in the United States. This figure in 1922 was approximately 48,000,000,000 kw.-hr. At present electricity is probably being generated at the rate of approximately 90,000,000,000 kw.-hr. per year. This is an increase of approximately 100 per cent between 1922 and 1929. Applying this rate of increase to the approximate 10,000,000,000 kw.-hr. sold for light in 1922, the present consumption of electricity for light is indicated as approximately 20,000,000,000 kw.-hr. per year. Consumption of electricity in other directions, especially in transit and railway electrification, probably has increased in somewhat greater ratio than has the lighting load. However, to be as conservative as possible in computing the saturation figure, it is proposed to accept the round figure of 20,000,000,000 kw.-hr. per year as the present consumption of electricity for lighting purposes in the United States.

Based on this figure and the data of the preceding table, the lighting saturation percentages at present, on the basis of the four assumed levels for the use of light, are approximately as shown in the accompanying table.

Approximate Saturation of Artificial Light

	Per Cent
Minimum good practice at present	**30**
Minimum recommended levels	**17**
Probable level of greatest economic advantage	**13**
Possible desirable levels from eye considerations only	**3**

Accuracy of the Computation—No claim is made that these figures are more than approximations. The present saturation of the continental United States in artificial light on the basis of a lighting level believed to offer the greatest economic advantage may be as low as 8 per cent or as high as 20 per cent, instead of the 13 per cent figure of the accompanying table. It seems less important to the lighting industry, however, to reach an exact figure for this percentage than it is to realize that any correct figure must be extremely low. The lighting load is a large part of the load of most central stations. It is interesting that it seems to be also the load which suggests so large an increase.

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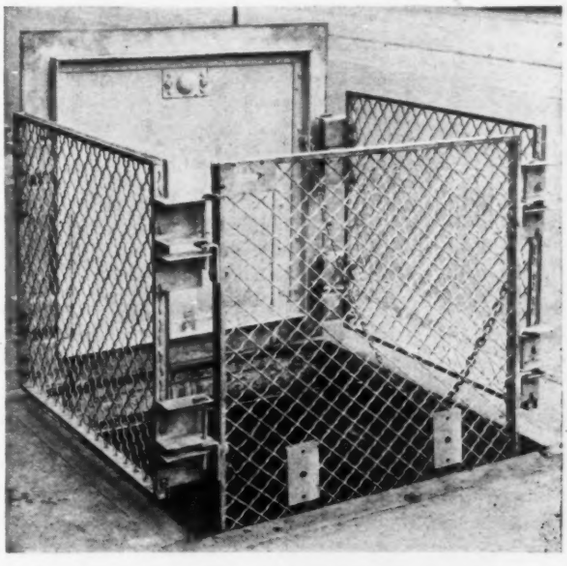
Keeping People Out of Manholes

By G. F. SPEER
Milwaukee Electric Railway & Light Company, Milwaukee, Wis.

A SIDEWALK hatchway guard that is efficient, easy to erect and that prevents unauthorized entrance to the vault is in use on the underground system of the Milwaukee Electric Railway & Light Company. As may be seen in the accompanying illustration one side of the guard is formed by the checker-plate, flush type, non-slip, hatchway door with restraining chain. The side opposite the door is made of a screen hinged at the bottom to the angle-iron hatchway frame. The hasp at the top left corner of this screen fits over a staple mounted on the frame below the door hinge. This permits locking the inner screen with a standard company padlock so that the vault is accessible to authorized persons only. The two side screens are fastened to the two doors by suitable slide bolts as indicated. The two side screens are suspended by hooks on the lower part of the screen door and hang down into the vault when the hatchway is closed. One man can open and close the hatchway. The entire contrivance is galvanized. It is installed in a removable reinforced concrete slab which can be taken out when necessary to install or remove a transformer unit.



The comic artist who pictures pedestrians walking into open manholes has no field in Milwaukee

READERS' FORUM

A Hazard Utilities Can Prevent

To the Editor of the ELECTRICAL WORLD:

In some of the smaller cities where identified interior wiring is used our customers have experienced serious trouble that is probably not unknown to other electrical manufacturers. One day the white wire in a home may be the grounded circuit and another day, in the same home, the colored wire will be grounded. In several cases this reversal of conditions has injured the "protecto" relays on our regulator systems.

Since shifting of the ground from one wire to the other has been found to be due to the changing of transformers, or outdoor circuits, we believe it would be guarded against if the hazard were brought to the attention of your utility readers.

KNOX REEVES,
Advertising Manager.

Minneapolis-Honeywell Regulator Company,
Minneapolis, Minn.

* * * *

Critical Analysis of Auxiliaries Brings Retort

To the Editor of the ELECTRICAL WORLD:

M. M. Samuels, in his article on auxiliary power systems, in the issue of November 9, apparently favors 220 volts over 440 or 550 volts for motors of less than 25 hp., on the basis of increased hazard and lack of suitable starting equipment for the higher voltages. The tendency in modern central station design is toward the complete elimination of live parts on the fronts of auxiliary switchboards installed throughout the station, particularly on those not under the direct supervision of the operating force. As the power leads at the motors are also insulated, and generally inclosed as well, it is difficult to see just where the greater danger lies in the use of the higher voltages.

The starting equipment problem is also quite satisfactorily solved by adopting full-voltage starting with the consequent elimination of all but a line switch of moderate rupturing capacity, with the time element of its overload protection set to throw the duty of clearing a short circuit to the group switch. It would, therefore, seem that the lower current values corresponding to 440 volts would make for increased economy without apparent sacrifice of either safety or reliability.

Too great emphasis can hardly be given to the necessity for careful study in the selection of proper alternating-current drives for forced- and induced-draft fans. The ratio of installed horsepower, to cover possible maximum draft requirements, to the average load, is so high in the majority of central stations that the difference in losses between those of wound-rotor induction motors and other more efficient and equally reliable adjustable-speed schemes, if capitalized, would more than justify the greater cost of the latter.

Mr. Samuels' suggested scheme of grouping auxiliary motors is not entirely new, having already been successfully used in a somewhat modified form in at least one large central station since 1926. In the installation referred to, the individual motors are provided with automatic overload breakers, but set so high that they will function only on short circuit in the equipment.

The advisability of leaving out all meters might be questioned, as the value of segregated auxiliary power consumption data necessary for allocating costs for record and comparison would, in most cases, justify the installation of house type watt-hour meters adjacent to the motors, or in some centralized location. Mr. Samuels has recommended test facilities for such meters, but it is entirely possible that the cost of installing portable meters and making tests would be greater than the total first cost of permanent recording meters.

Thomas E. Murray, Inc.
New York City.

C. G. KILBOURNE,
Electrical Engineer.

* * * *

Station Auxiliary Switching

To the Editor of the ELECTRICAL WORLD:

I was glad to read M. J. Lowenberg's letter in your December 14 issue and to find that my idea to eliminate automatic features on auxiliary motors has not only been anticipated but is in actual use at a prominent station. I disclaim all priority. In fact, the idea was suggested by W. A. Rossell of Westinghouse as far back as 1917, but it could not be used then because manufacturers were not ready to sell across-the-line motors, so that the designers of Edgar station deserve due credit for initiating the scheme.

However, Mr. Lowenberg states that an inexpensive oil circuit breaker is used both on the 2,300-volt and the 550-volt. Such an oil circuit breaker, even though non-automatic, would have to have a sufficiently high short-time rating not to blow up in case of a short before the main group breaker opens.

If any one sells such a breaker at a price which can be termed "inexpensive," I should like to know his address, and I promise to treat the information as confidential.

M. M. SAMUELS.

The J. G. White Engineering Corporation,
New York.

* * * *

We Appreciate This Communication

To the Editor of the ELECTRICAL WORLD:

I thought you might be interested in the accompanying letter, which gives an idea of the extent of coverage of the ELECTRICAL WORLD. The letter refers to my article "Simplified Rigging for Erecting Strain Insulators," which appeared on page 728 of the October 12 issue. I have given Mr. Volpato the information requested.

Alcoa, Tenn.

J. ELMER HOUSLEY

We have read with special interest your relation page 728 of Nov. 15 in the ELECTRICAL WORLD referring to the study of equipments of triple chains on the line of 154,000 volts and we would be extremely grateful to you if you would be so kind as to furnish us with a very detailed design of yokes and special mechanical mounting pieces adopted by you.

Societa Anomina,
Fabbrica Isolatori Livorno,
Milan, Italy.

E. VALPOTA,
Director.

Men of the Industry

P. W. Sothman Completes Work on Shannon River Development

PETER W. SOTHMAN, chief electrical engineer of the Department of Industry and Commerce, Dublin, Ireland, has just completed the River Shannon development for the Irish Free State, in which he has been engaged since 1926. Mr. Sothman is well known both in this country and abroad, having practiced his profession in Canada, Russia, Germany, France, Switzerland, Scandinavia and South Africa.

In 1892, after having completed his university studies in Hamburg and Berlin, Mr. Sothman, a Dane by birth, entered the employ of Siemens & Halske, Berlin, and soon was given charge of light and power installations in large factories, asylums, government buildings and municipalities. Five years later he became identified with the German General Electric Company as chief engineer for large power plants. In this connection he went to Strasbourg, where he pioneered in parallel operation of alternators, the system ultimately becoming one of the most prosperous and prominent in Europe. In 1906 he was chosen chief of the Hydro-Electric Power Commission of Ontario, where he laid the foundation for its present 120,000-volt system.

In 1912 Mr. Sothman opened offices as consulting engineer in Toronto and New York and was engaged for some very large and important work in the United States, Canada, South America, Europe and Asia. It was in 1926 that he removed to Ireland to engage in the Shannon River development. Now that this scheme is completed, Mr. Sothman is considering devoting his time to representing American enterprises in Europe, negotiating, inspecting and reporting in the capacity of consulting engineer. Mr. Sothman has to his credit more than 34 patents and is the author of many books and papers on technical subjects. He is a fellow of the American Institute of Electrical Engineers and a member of many other engineering associations.

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Rogers, Pratt and Royce Retire from Stone & Webster

STONE & WEBSTER announces the retirement of Howard L. Rogers, Frederick S. Pratt and Frederick P. Royce as vice-presidents, following many years of service with this house.

Mr. Rogers has been identified with the engineering activities of Stone & Webster throughout the major portion of his career, having begun as a draftsman and risen to election in 1928 as senior vice-president of the Stone & Webster Engineering Corporation. He has had marked influence upon the engineering construction and accounting practice of the company, has served in the purchasing field and as a member of the operating committee.

Mr. Pratt was identified with early testing and electric railway construction work of the firm, devoted considerable time to collateral chemical interests and research, and in later years has been prominent in the management and executive administration of regional utility properties managed by Stone & Webster. From 1909 until recently Mr. Pratt supervised all the Puget Sound properties of the house and also the Sierra Pacific Electric Company, Reno, Nev. He was made a member of the firm in 1920 and when the house was incorporated he became a vice-president.

Mr. Royce's early career was associated with the Malden (Mass.) Electric Company and Charles H. Tenney & Company, Boston. For about ten years he was vice-president of leading utilities under Tenney management, and after joining Stone & Webster served as division manager for a number of properties. He became a partner in Stone & Webster in 1920 and was vice-president in charge of the securities division until Stone & Webster and Blodget was incorporated in 1927. For the past two years he has devoted himself to executive matters, special studies and financial problems.

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T. W. Frech Heads R.C.A. Radiotron Company

T. W. FRECH, vice-president of the General Electric Company in charge of the incandescent lamp department, has been granted a year's leave of absence to become president of the R.C.A. Radiotron Company, organized on January 1. Mr. Frech has long been associated with the incandescent lamp business, starting with the General Electric Company in 1901. He played an important part in the development of the tantalum lamp, the pressed filament tungsten lamp and the drawn wire

tungsten lamp. His rise to the head of the General Electric Company's incandescent lamp business has been one of steady progress marked by achievement in every position he has held.

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H. B. Soper Assumes New Duties

In anticipation of the inauguration of service next fall over the 220-kv. transmission line of the New England Power Company system between the new Fifteen-Mile Falls hydro-electric development on the upper Connecticut River and Tewksbury, Mass., Harry B. Soper, assistant superintendent of power, western division New England Power Company, has been appointed superintendent of power for the northern division. Mr. Soper has been assistant superintendent with headquarters at Shelburne Falls, Mass., since entering the company's service in November, 1913. His new jurisdiction will include the hydro-electric stations in the Fifteen-Mile Falls district, the switching station at Andover, N. H., and the reservoirs, property, transmission and distribution circuits of the New England Power Association's companies in northern Vermont and New Hampshire.

▼

M. G. Clark, vice-president and general manager of the Green Mountain Power Corporation, Montpelier, Vt., has resigned and will devote his time to other business interests. W. N. Ryerson, executive vice-president, will have the active management of the affairs of the company.

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W. W. Miller Heads G.E. Industrial Department

W. W. Miller, who has succeeded E. O. Shreve as manager of the industrial department of the General Electric Company, has been connected with that organization since his twelfth year, when as an office boy he worked through the summer vacation. Following the completion of his high school course, he definitely associated himself with the power and mining department of that company and later entered the armature and coil winding department of the Schenectady Works.

Mr. Miller joined the test department in 1900, left in 1902, spent half a year in drafting, and then joined the power and mining engineering department. In June, 1908, he was given a leave of absence to become electrical engineer for the Bausch & Lomb Optical Company of Rochester, supervising the change of that company's plant from mechanical to electrical drive. Returning to General Electric in January, 1910, he joined the railway engineering department, later was transferred to the power and mining department (now the industrial) and

under Mr. Bush, he helped to form, and was placed in charge of, the mining section. On March 15, 1920, he was made an assistant manager.

OBITUARY

Dr. S. Z. De Ferranti

Dr. Sebastian Z. De Ferranti, eminent engineer and inventor and past-president of the Institution of Electrical Engineers of Great Britain, died at his home in England, January 13. Dr. Ferranti, who was born in Liverpool, had been an outstanding figure in British electrical circles for a number of years. At an early age he showed a decided penchant for mechanics and while still a school-boy he started the building of his first dynamo. Continuing to direct his attention to the development of electrical devices, he had to his credit inventions in various lines which are among the most notable contributions to electrical art.

Working with Sir William Thomson, he invented an electrical alternator which created quite a stir among electrical men. About 1883 Sir Coutts Lindsay, president of the Grosvenor Gallery, decided to adopt the Gaulard & Gibbs transformer system of distribution, which was then coming into vogue. The system was highly successful and led to the taking on of a considerable extension of the plant, and Mr. Ferranti was selected to engineer these extensions.

The extension of the service ultimately made expedient the construction of a new plant at Deptford. It was here that Mr. Ferranti carried out some notable ideas in installation. In spite of many difficulties the undertaking was carried to a successful completion and the accomplishment remains a monument to his ability and zeal. Recently he had been interested in radio and had devoted much time and energy to this field of engineering. In 1910 he was elected president of the Institution of Electrical Engineers of Great Britain and in 1926 to honorary membership.

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Frederic Cutts, manager of the United Illuminating Company, Bridgeport, Conn., died January 11, following an infection of the throat. Mr. Cutts became manager at Bridgeport two years ago after fifteen years of service with the General Electric Company, New Haven, Conn. He was born in New Rochelle, N. Y., and following graduation from Wesleyan University and Cornell he went with the General Electric Company, Schenectady. Subsequently he removed to the General Electric Company's Atlanta office. A number of years later he was transferred to New Haven and was manager of the General Electric Company's offices there.

Financial and Statistical News

DEBENTURE FINANCING is proving the most popular type this year to date; most of the new issues carry the convertible feature. Two more issues this week, totaling more than $50,000,000, bring the figure for debentures sold during the first half of January to $115,000,000, an unusually large total for the period.

——FURTHER LARGE SCALE MERGER OPERATIONS are rumored to be shaping up in the eastern part of the country, but will probably not involve public financing.

——MARKETS CONTINUE TO MARK TIME, with little change in utility averages since the first of the year.

Howard Discloses Holdings of United Corporation

SECURITY HOLDINGS OF United Corporation were revealed by G. H. Howard, president, in testimony given to the special legislative commission on revision of the Public Service Commission law. The statement showed accumulation of United Gas Improvement stock, but no holdings in Consolidated Gas of New York.

The portfolio of United Corporation showed the following holdings:

United Gas Improvement Com.	4,151,846
do pf	94,360⅝
Mohawk-Hudson 2d pf	62,320
Niagara Hudson com	673,249½
do A option warrants	752,459⅞
do B option warrants	436,590
do C option warrants	300,000
Public Service of N. J.	959,921
Allied Power & Light	340,000
Columbia Gas & Electric	171,100
do part paid receipts	25,110
Commonwealth & South'n	948,269
do option warrants	580,000
Lehigh Coal & Navigation	11,035
French Utilities (Lyons)	30,000
Electric Bond & Share	80,000

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Connecticut Utility Elects New Officers

ROCKVILLE-WILLIMANTIC LIGHTING COMPANY, Willimantic, Conn., a subsidiary of the Connecticut Electric Service Company, Hartford, Conn., serving Rockville, Willimantic and Stafford Springs, also adjacent territory, with gas and electric current, has elected the following new officers: President, J. Henry Roraback; vice-presidents, Robert W. Perkins, Norwich, and R. H. Knowlton, Hartford; secretary-treasurer, Charles L. Campbell, Hartford.

While the Rockville-Willimantic interests are already under actual management of the Connecticut Electric Service Corporation actual transfer will not take place until about February 1.

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GENERAL ELECTRIC VOTES SPLIT.—Stockholders of the General Electric Company at a special meeting held January 15 in Schenectady ratified the proposal to split the common shares on a four-for-one basis. This change will increase the 7,400,000 authorized shares of no par value to 29,600,000 shares and increase the number of outstanding shares from 7,211,482 to 28,845,928. The new shares were approved for listing on the New York Stock Exchange.

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NEW CAPITAL ISSUES

THREE-YEAR 5 per cent coupon gold notes have been issued by the Edison Electric Illuminating Company of Boston to the amount of $30,000,000, the price being 98¾ and interest, to yield over 5.45 per cent. Proceeds of these notes will retire all floating indebtedness and leave approximately $6,000,000 for future extensions of the property. Upon completion of this financing Edison's capitalization will consist of this issue of $30,000,000 of 5 per cent notes, due January 15, 1933; $30,000,000 of three-

No Overproduction Exists in Electrical Facilities

By JOHN J. O'BRIEN

President Standard Gas & Electric Company

SO FAR as can be ascertained there is nothing approaching an overextension or overproduction of electric and gas facilities or service. The facts point to the contrary, and this is why expansion will continue on a reasonable earnings basis. Large additional fields of service await development. Much remains to be done to further interconnect electric systems and in the long-distance transmission of gas. Due to decreased rainfall there is a shortage of hydro-electric power in the North and West. Even without such shortage additional steam-electric capacities are needed and will be provided.

Few if any other industries are in better position to finance construction than the utilities. First is their exceptionally strong cash position; second, the increased equities built up by junior financing and, third, the customer-ownership method of financing, which the utilities developed in a manner most beneficial to the public and their own progress.

There is every reason to believe that the electric and gas industries will continue to expand and increase earnings at a substantial rate during 1930. Construction programs, as already planned and announced, are large and were made to serve increasing public demands of a fundamental character. Major projects, so far as I know, will be carried out as planned in 1930 in the absence of anything in the present situation to warant lack of confidence in the growth and prosperity of the United States.

year 4½ per cent notes, due November 1, 1930, and $53,487,500 of capital stock par value $100. The company has shown a steady growth over the past few years, gross earnings increasing from $19,494,784 in the year ended December 31, 1924, to $29,471,249 for the year ended November 30, 1929, and during the same period net has grown from $7,736,143 to $12,947,194.

Associated Gas & Electric Company has made an offering of convertible 5 per cent gold debentures to the amount of $30,000,000, the price being 90 and interest, yielding 5.85 per cent. These debentures will be convertible at any time after March 15, 1931, and on or before March 15, 1933, into class A stock at the rate of eighteen shares for each $1,000 debenture. The convertible debenture obligations of the company, which are now convertible into stocks at the company's option, and the preferred, class A and B and common stocks, which are junior to this issue of debentures, have an aggregate value estimated, on the basis of current quotations, to be in excess of $400,000,000.

Five per cent debentures, series C, of the North American Edison Company have been issued to the amount of $25,000,000 at 95½ and interest, to yield over 5.25 per cent. The purpose of this issue of debentures is to provide funds for additional investment in the company's subsidiaries, and for other corporate purposes.

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Utilities Announce Further Construction Programs

A TOTAL OF $15,250,000 will be spent by public utility companies in Louisiana during 1930 for improvements, new construction and expansion of present facilities. Announcement of the expenditure of this sum was made by officials of the utilities in New Orleans and the program dovetails with the suggestions outlined by President Hoover at his recent conference at which he urged public improvements and utility expansions be expedited as the most certain means of restoring industrial confidence and stabilizing the money and stock markets.

About $8,000,000 of the amount is to be spent in and around New Orleans. Another $6,000,000 is to be spent in erecting a gigantic steam-electric power plant at Baton Rouge. As a result of the comprehensive development program, Louisiana will become the power center for the greater part of the territory south of Memphis and extending east and west from Florida to Texas.

Public utilities will spend $36,000,000 in Wisconsin in 1930, as compared with an expenditure of $29,700,000 in 1929, for extensions, additions and improvements of their properties.

Electric and gas service was made available to people of 58 communities in the state during 1929, electric service being brought into 37 communities. Total taxes paid by the utilities industry in the state to the several branches of government totaled approximately $5,500,000, an increase of 9 per cent over the preceding year. Taxes on utilities were increased at the last session of the state Legislature by $700,000.

The Syracuse Lighting Company, Inc., has appropriated more than $5,000,000 for construction work in 1930, including appropriation carried over from 1929.

The 1930 budget of the Kansas City Power & Light Company will be about $9,000,000, according to J. F. Porter, president. This announcement was made in connection with the opening of the fifth large unit in the Kansas City company's electrical generating equipment.

Anticipated expenditures of approximately $2,000,000 by the Kentucky Utilities Company, Louisville, for improvements during the coming year will furnish employment to several hundred construction men, President L. B. Herrington announces. The program is about equal to that of 1929.

Additional employees will be required to carry out the five-million-dollar construction program of the Louisville Gas & Electric Company during the coming year, T. Bert Wilson, vice-president and general manager, says. This program involves 40 per cent more than was expended last year in Louisville and its suburbs.

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Current Changes Strengthen Utility Capital Structures

THE reported oversubscription of issues as large as $150,000,000 within the past week necessitates some modification in earlier predictions that it would be difficult to secure new capital requirements in the first half of 1930. The bond market especially is in a decidedly healthier condition than it has been at any time for many months. The shelves are clearer of undigested issues providing for prompt assimilation of new issues of an attractive nature and investment bankers are using more discretion with regard to what they expect a market to absorb than they used during the early part of last year. Investment trust issues, for example, are noticeably lacking.

While capital operations are taking the form, ostensibly, of bond and debenture financing almost entirely, many utility systems have laid out extensive customer-ownership programs. Furthermore, convertibles are becoming more and more popular and rights will be used in 1930 on a large scale. It is rumored that an issue of rights will be offered by the American Telephone & Telegraph Company to supplement the $150,000,000 bond issue sold this week. Insull Utility Investment, Inc., attached both a convertibility clause and a stock purchase warrant provision to its recent $60,000,000 debenture issue. Many issues of rights offered last autumn will be exercised during the early part of 1930.

All this strengthens the capital structure of the utilities by maintaining an adequate equity balance at a time when the market is more receptive to obligation securities.

Another development now under way is strengthening the capital situation materially. That is the elimination of intermediary holding companies and the retiring of subsidiary securities in many utility situations. Recent examples are the consolidation of the Commonwealth & Southern group and the simplification in certain respects of the Standard Gas system.

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Commonwealth & Southern Increases Directorate

JACOB HEKMA and F. P. CUMMINGS, vice-presidents of Commonwealth & Southern Corporation, have been elected members of the board of directors. The board at a recent meeting declared a quarterly cash dividend of 15 cents per share on the common stock payable March 1 to stockholders of record February 10. This action places the common stock on a cash dividend basis instead of the previous stock dividend basis. Electric output of the Commonwealth & Southern Corporation properties in December was 513,700,000 kw.-hr. as compared with 496,900,000 kw.-hr. in December, 1928. Total output for the year ended December 31, 1929, exceeded 6,376,000,000 kw.-hr., as compared with 5,781,000,000 kw.-hr. for the twelve months ended December 31, 1928, an increase of more than 10 per cent.

Manufacturing Activity Continues Downward

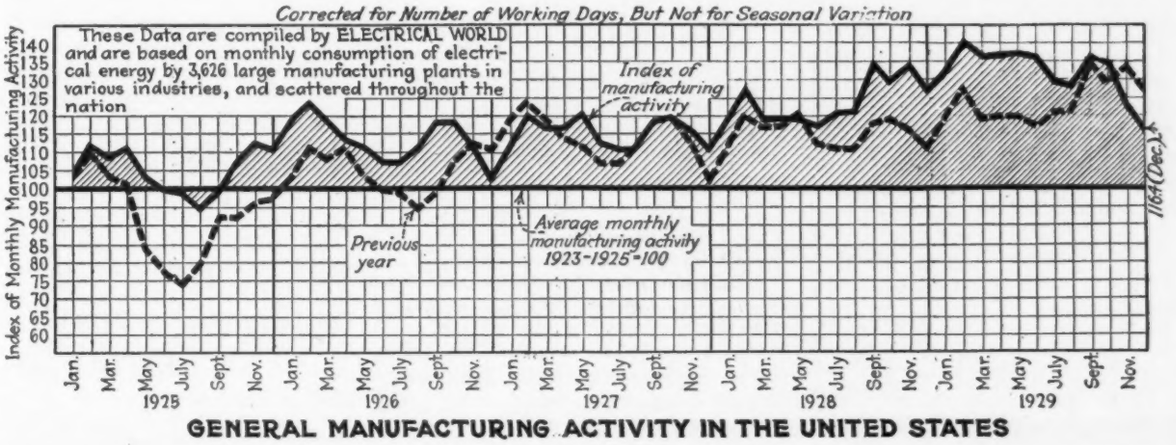
MANUFACTURING operations in the country as a whole during December based on the consumption of electrical energy were about 5.3 per cent under those of November and 8.6 per cent under December, 1928, according to reports received from more than 3,600 manufacturing plants by the ELECTRICAL WORLD.

The year 1929 stands out as one of record operations, the average rate of productive activity during the year exceeding that of 1928 by 6.6 per cent. Nine of the primary manufacturing groups witnessed an average rate of operations during 1929 over that reported for 1928, and only three groups reported average 1929 operations under those of 1928. Only four industrial groups, however—chemical products, paper and pulp, shipbuilding and stone, clay and glass—closed the year with a rate of operations over those at the close of 1928.

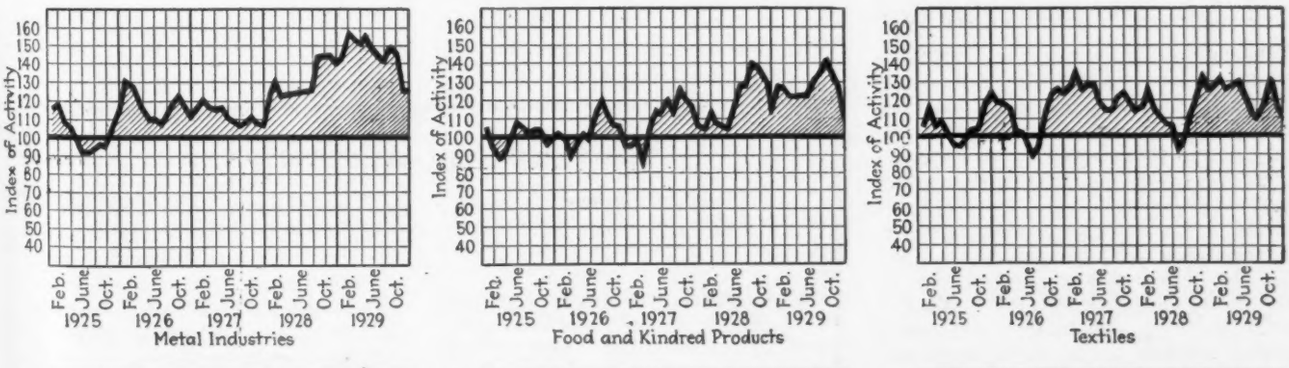
Only two manufacturing groups—chemical products and shipbuilding—reported December operations over those of November, and only one—stone, clay and glass—reported December operations the same as those of November. The greatest December drop as compared with November was reported by lumber products, with a drop of 17.0 per cent, followed by food products with 12.2 per cent; automobiles, including the manufacture of parts and accessories, 10.2 per cent; leather products, 8.6 per cent; textiles, 4.9 per cent; rubber products, 4.1 per cent; rolling mills and steel plants, 2.1 per cent; paper and pulp, 1.1 per cent, and metal-working plants, 1 per cent.

Comparing current operations with those at this time in 1928, eight manufacturing groups reported a drop and four reported an increase over 1928.

The South and West were the only sections closing the year with a rate of operations over those of December, 1928. Only one section, the Southern states, reported increased operations in December as compared with November.


Corrected for Number of Working Days, But Not for Seasonal Variation
These Data are compiled by ELECTRICAL WORLD and are based on monthly consumption of electrical energy by 3,626 large manufacturing plants in various industries, and scattered throughout the nation
Index of manufacturing activity
Previous year
Average monthly manufacturing activity 1923-1925=100
116.4 (Dec.)
Index of Monthly Manufacturing Activity
1925
1926
1927
1928
1929

GENERAL MANUFACTURING ACTIVITY IN THE UNITED STATES



ACTIVITY IN THE PRIMARY MANUFACTURING INDUSTRIES OF THE UNITED STATES

Business News and Market Conditions

N.E.M.A. Midwinter Meeting Convenes January 20

MEMBERS OF THE National Electrical Manufacturers' Association will convene in New York next week during the five-day midwinter meeting of N.E.M.A., which opens on Monday, January 20. Meetings will be held in the Westinghouse Lighting Institute, the Commodore Hotel and N.E.M.A. headquarters.

At a general session on Tuesday afternoon at the Westinghouse Lighting Institute Clarence L. Collens, president, will make an address on "Electrical Manufacturing Conditions in 1930." Thomas W. Howard, director of uniform accounting, will speak on "Are Marketing Costs Too High?" The business situation and outlook will be discussed by Virgil Jordan, economist of *Business Week*.

Many conferences will be held by various sections, groups, divisions and committees. An informal dinner party is arranged for Tuesday evening at the Commodore Hotel.

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Westinghouse Electric Enters Refrigerator Market

WESTINGHOUSE ELECTRIC & MANUFACTURING COMPANY will enter a new field February 1, when it will begin distribution of its new refrigerator in a group of cities in the Middle West. The refrigerator will be produced in five models and two finishes, porcelain and lacquer. C. D. Taylor, manager of the refrigeration division, said:

"The Westinghouse company in entering this field desired to produce a refrigerator of such simplicity of design that it could be set up in the home just as shipped from the factory, with a minimum of work in installation. In order to accomplish this result, we have designed a unit which is one integral piece of mechanism.

"Several new ideas in design and operation are embodied in the Westinghouse refrigerator. The motor and compressor operate in a hermetically sealed case with no attention from the owner. A blower fan which increases the refrigerator's efficiency takes its power from the main motor by magnetic rather than mechanical means, thus eliminating one big source of trouble.

"All models of the new refrigerator have a standard height of sixty inches and a standard depth of twenty-seven inches. Only the width is varied in each size of cabinet. Standardization is further carried out by the refrigeration units which are built in only two sizes in order to effect interchangeability. All hardware is of long-life chromium plate, severe but pleasing in design."

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Big French Electrification Project

SOME TIME AGO PLANS were prepared for the electrification of the Paris-Lyons-Mediterranean Railroad, but the cost of the project is so great that the program can only be carried out a section at a time. Shortly, however, the 84 miles between Culoz and Modane will be electrified. As far as Saint Pierre d'Albigny the line is sufficiently level to permit high speeds, after which it rises steadily in a gradient of 3 in 100.

Power will be supplied by seven power stations driven by the energy derived from three small rivers, the Arly, tributary of the Isère; the Doron and the Beautort, tributaries of the Arve, but only a small proportion of the current will be used by the railroad, the rest being distributed over the surrounding district. A third rail will be laid to carry current, overhead traction being used only in larger stations.

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Utilities Help Our Trade with South America

AMERICAN PUBLIC UTILITIES operating in South America are real ambassadors of good will, George S. Messersmith, American Consul-General in Argentina, told an interviewer in St. Louis. He was in that city to consult with manufacturers and exporters at the United States Bureau of Foreign and Domestic Commerce. His headquarters are in Buenos Aires.

He said that the utilities by decreasing rates and giving better service to patrons have, during the period they have been in operation in Argentina, done much to do away with South American antipathy to the United States and the belief that American capital was inexperienced in South America.

"The investment of American capital in Argentina was limited until a year ago to national, provincial and municipal loans," Mr. Messersmith said, "but about fourteen months ago two great American public utilities started to purchase electric light and power com-

WHY SOME BUSINESSES FAIL

Inadequate records of inventories, turnover, costs, unit profits, etc.

* * *

Improperly trained personnel, especially in the retail trades.

* * *

Lax credit control. This causes losses exceeding half a billion dollars yearly.

* * *

Expensive transfer costs. Delivery and redelivery costs are often excessive.

* * *

Mass or volume mania often exists instead of selective marketing. There is a tendency to expand gross sales without a comparable rise in profits.

* * *

Unimpressive and inefficient store layout. Tests have shown this to be an exceedingly important merchandising factor.

* * *

Overlooking the new tempo of styles and fads.

* * *

Antiquated accounting instead of simple modern methods.

* * *

Failure to collaborate with related industries, which would frequently lower distribution costs materially.

panies in Argentina and Chile. They now own 145 companies formerly owned by British public utilities, and the International Telephone & Telegraph Company, through one of its subsidiaries, has acquired a telephone system in Buenos Aires."

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Allis-Chalmers Unfilled Orders Up 50 per Cent

THE YEAR 1930 should prove to be a highly successful one for the Allis-Chalmers Manufacturing Company, if getting a good start means anything. The new year was ushered in with unfilled orders on the company's books having a value of approximately $13,000,000, or an increase of almost 50 per cent over the figue recorded at the beginning of 1929.

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General Electric Receives Portland Electric Order

IT IS REPORTED that Portland Electric Power Company has placed an order with the General Electric Company for one 35,000-kw., 85 per cent power factor, 385-lb. throttle-pressure turbo-generator unit, with 45,000-sq.ft. Ingersoll-Rand condenser, one 2,550-hp. B.&W. Company Stirling boiler, Griscom-Russell feedwater heaters and evaporator and various other steam plant auxiliaries. These additions to the steam capacity of the system should be in operation by October 15, 1930.

In addition, an order has been placed with the Pelton Water Wheel Company of San Francisco for one 40,000-hp. turbine for the Oak Grove project, duplicating the original unit at that plant. The head is 860 ft., speed 514 r.p.m.; the main butterfly valve for shutoff at the turbine is fitted with hydraulic operation and an automatically controlled, hydraulically operated butterfly valve is placed at the head of the penstock for automatically closing off the water flow in the event of emergency. The generator being furnished by the General Electric Company will have welded structural steel frame, transposed turns in stator windings, improved iron, etc., and in addition will have surface air cooler. The penstock will be made of riveted steel by the Willamette Iron & Steel Works.

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SARGENT & LUNDY, INC., engineers, announce the removal of their offices from 72 West Adams Street, Chicago, to 20 North Wacker Drive, Chicago.

Market Conditions

RENEWED OPTIMISM for an excellent year in electrical equipment on the Pacific Coast is evident. It is estimated that more than $200,000,000 will be spent in 1930-31 by power companies along the Coast. Farm extension work is particularly active at the moment.

——THE TREND OF THE MARKET IN THE Eastern district is definitely upward. Substation and auxiliary apparatus lead in demand.

——PERSISTENT UNFAVORABLE WEATHER IN THE Southwest is blamed for holding up electrical orders, which are rather slow in coming in.

EASTERN

—THE TREND IS UPWARD *in the electrical equipment market in the Eastern district. Power companies are making sizable purchases, with substation and auxiliary apparatus leading in demand; current commitments are heavier than at any time since the decline in the security market.*

—INDUSTRIAL INTERESTS, ALSO, *are beginning to make purchases, and while conditions in this line are still a little spotty, there is noticeable betterment in the volume of inquiries.*

—ANOTHER IMPORTANT CONTRACT *has been placed for electric locomotives and the outlook for early railway business is excellent.*

Metropolitan business for central-station service forms a feature of present demand. A local power company has placed an order for switchgear with a state manufacturer, totaling $50,000, and for transformers to cost about $30,000. A central station in North Carolina has contracted with a New York manufacturer for switchgear, transformers and allied equipment to the sum of $120,000, while an Indiana power utility has also ordered similar equipment from the same maker. A Pennsylvania manufacturer has secured a contract for a 25,000-kva. waterwheel generating unit for a hydro-electric power development in Georgia. An order has been taken by a Middle West manufacturer for Diesel engine units for a municipal power station installation in Wisconsin. A northern New York power company has purchased a quantity of control equipment from a state maker, costing $175,000. A central station in New Jersey has closed with a New York manufacturer for transformers in an amount of $80,000. A Baltimore power interest has placed a commitment with a Pennsylvania manufacturer for a 30,000-kva. frequency changer, with auxiliary equipment, while a West Virginia central station has purchased switchgear and substation apparatus from a New York manufacturer, costing $35,000.

Railway account looms strong and the contract placed by the Reading Company with the Philadelphia Electric Company for power requirements for its electrified suburban lines in the Philadelphia district is giving impetus to the situation. The award covers a twenty-year period, with estimated expenditure of $1,500,000 per annum. The power company will build a frequency-changing station at Wayne Junction to cost more than $1,200,000 for this service and will also install 13,000-volt underground conduit lines to that point. The Pennsylvania Railroad will install a continuous cab signal system on its Pittsburgh division to cost $2,000,000. The New York Central Lines have placed a contract for electric locomotives with the General Electric Company to cost $375,000, the units to be used in the Chicago territory. The Delaware, Lackawanna & Western Railroad has contracted for railway motors and parts to the amount of $50,000.

Iron and steel mills are entering the market for heavy industrial motors, controls and auxiliary equipment. Fractional-horsepower units are showing a revival, and a manufacturer of electric washing machines in New York has placed an order with a state maker, totaling $45,000. Ice-manufacturing plants, also, are making commitments.

CONSTRUCTION PROJECTS

American Smelting & Refining Company, New York, contemplates extensions and improvements in smelting plant at El Paso, Tex., to cost $100,000. Kent Garage Operating Company, New York, plans service and garage building to cost over $600,000. General Baking Company, New York, will take bids for a baking plant at Detroit, Mich., to cost $900,000. Board of Education, New York, has plans for a technical

high school in Brooklyn, estimated to cost $6,000,000. Niagara Hudson Power Company, Buffalo, N. Y., will carry out expansion at hydro-electric power plant at Spier Falls to double present capacity, reported to cost more than $5,000,000. Western Electric Company, New York, plans expansion program in cable, telephone equipment and radio plants during present year to cost $50,000,000. Textileather Corporation, Newark, N. J., will make extensions in plant at Toledo, Ohio, to cost over $750,000. State Board of Education, Trenton, N. J., is having plans drawn for a power plant at the Trenton Normal School. East Orange, N. J., contemplates extensions and improvements in street-lighting system. Riverside Metal Company, Riverside, N. J., will build addition to cost in excess of $300,000. Lit Brothers, Philadelphia, Pa., will soon take bids for a power plant for department store service, estimated to cost $200,000. Department of City Transit, Philadelphia, Pa., will receive bids until January 21 for electrical switching and control equipment for substations for Broad Street subway. Superior Paper Products Company, Carnegie, Pa., has plans nearing completion for plant to cost $135,000. Pennsylvania Power & Light Company, Allentown, Pa., plans extensions and improvements in power stations and lines in the Harrisburg, Pa., district, to cost about $1,700,000. Ellwood City, Pa., contemplates a municipal electric light and power plant. Pittsburgh Plate Glass Company, Pittsburgh, Pa., is reported planning extensions and betterments in plant at Fairmont, W. Va., to cost close to $180,000. The Post Quartermaster, United States Army, Fort Jay, Governors Island, N. Y., will receive bids until January 31 for stoking and blower equipment for burning of small sizes of anthracite coal (Circular 28.)

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SOUTHWEST

—THE PERSISTENT SPELL *of rain, snow and sleet in the St. Louis district may partially account for a marked slowing up in the number of orders in most lines of electrical business.*

—SALES OF THE REGULAR RUN *of stock sizes have decreased appreciably in volume. However, there is no indication of uneasiness on the part of manufacturers or central station operators. The latter say that the program for expansion this year is a good one and they look forward to a normal increase in business.*

The only order of contract size reported is one amounting to $5,000 for conduit wire insulators and switchboard for an addition to a plant in central Illinois.

CONSTRUCTION PROJECTS

Unionville, Mo., plans extensions and improvements in municipal electric light and power plant, reported to cost over $50,000. National Garage Company, Kansas City, Mo., has plans for a service and garage building to cost $650,000. Fred Dold Company, Wichita, Kan., has filed plans for an addition to meat-packing plant to cost $200,000. Public Service Company of Oklahoma, Tulsa, Okla., contemplates a steam-operated power plant at Hulbert, Okla., to cost about $100,000. Arkansas Power & Light Company, Pine Bluff, Ark., plans ornamental lighting system at Morrilton, Ark. Arkansas Power & Light Company, Little Rock, Ark., plans addition to power substation at North Little Rock to cost more than $100,000. Texas & Pacific Railway Company, Dallas, Tex., will build a power plant at proposed locomotive shops at Big Spring, Tex., entire project to cost more than $150,000. Cleburne, Tex., has called a special election on February 11, to approve bonds for a municipal electric light and power plant. Acme Products Company, New Orleans, La., plans extensions and improvements in turpentine plant at DeQuincy, La., to cost over $500,000. Oakdale, La., plans extensions in street-lighting system.

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MIDDLE WEST

—GENERAL BUSINESS *in the Middle West section is proceeding on a satisfactory basis. The volume of business has not increased as much as hoped for, however.*

—PRESENT INDICATIONS SEEM TO POINT *to a banner year of building activity, in which the Middle West territory will figure to a large extent.*

One utility company alone scheduled 335,000 lb. of weatherproof cable for installation during February. Some of the interesting orders placed this week include soot blowers for one reheat and two standard steam-generating units to cost $30,000, six "Vorticose" dust collectors for four standard and two reheat steam-generating units to cost $160,000, six motor-driven boiler feed pumps to cost $45,000 and 750,000 lb. of triple-braid weatherproof wire and cable. Jobbers' sales are normal for this time of year. Considerable railroad and municipal business is being obtained, although industrial business is somewhat slow. There has been a good demand for most electrical appliances.

CONSTRUCTION PROJECTS

Milwaukee Electric Railway & Light Company, Milwaukee, Wis., is said to have plans maturing for a steam-operated power plant at Port Washington, Wis. Board of Education, Milwaukee, Wis., is having plans drawn for a girls' trade and technical school to cost $250,000. Harnischfeger Corporation, West Milwaukee, Wis., plans addition to heavy machinery manufacturing plant to cost $200,000. Great Lakes Coal & Dock Company, Superior, Wis., will soon take bids for a coal dock and equipment to cost $500,000. Chicago *Tribune*, Chicago, Ill., plans twenty-story newspaper plant and office building to cost $7,500,000. Commonwealth Edison Company, Chicago, Ill., has filed plans for a power substation to cost $40,000. National Steel Company, Weirton, W. Va., plans mill at Gary, Ind., to cost $35,000,000; a power plant will be built. Richmond, Ind., will make extensions and improvements in municipal electric light and power plant to cost more than $200,000. Fairmont Creamery Company, Cleveland, Ohio, plans ice cream factory to cost more than $400,000. Otter Tail Power Company, Fergus Falls, Minn., plans power plant at Appleton, Minn. Oronoco, Minn., plans hydro-electric power plant to cost more than $100,000. Duluth and Northfield, Minn., plan ornamental lighting systems. Holdrege, Neb., plans extensions and improvements in municipal electric light and power plant, including installation of 1,000 hp. turbo-generator unit.

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NEW ENGLAND

—IMPROVEMENT IN ELECTRICAL EQUIPMENT *marketing is reported in this district, with sales in industrial equipment quite active and negotiations and inquiries increasing in number.*

—A LITTLE BETTER THAN NORMAL *conditions are reported by one well-known manufacturer.*

—INDUSTRIAL EQUIPMENT SALES *gained in volume during the past week; small motor sales were encouraging; small switch and control apparatus sales increased; the first two weeks of the current year, according to one manufacturer, show sales well up to normal and prospects for a continuance bright.*

Tool manufacturers are buying conservatively and orders for fractional-horsepower motors are maintaining a steady level. Motor orders amounting to over $20,000 were placed by one manufacturer. Another reports several interesting orders for industrial power equipment and control amounting to over $12,000. Heavy power equipment is receiving more attention and inquiries are gaining.

Central-station equipment sales are spotty; orders for two 5,000-kva. transformers for western Massachusetts will be placed in the near future. Scheduled materials are selling well. Interior lighting units are in demand. One manufacturer reports inability to supply such on demand. Special equipment for refrigerating plants is being considered for new projects in this district. Heavy demands for wire and cable, outside line requirements, are anticipated in view of an extensive expansion in telephone and power lines.

Merchandising continues to show strength in sales. Industrial expansion in this district recently announced indicated further sales possibilities to small specialty manufacturers.

Yale University will expand housing facilities through a recent gift estimated at more than $15,000,000. New Eng-

land Telephone & Telegraph Company will expend $37,000,000, of which $18,000,000 will be for new buildings and additional equipment for service stations and lines. General Electric Company plans addition to Pittsfield plant. Bryant Knitting Mills, Malden, Mass., will add a new mill. Safepack Mills, Millis, Mass., will add a new plant.

CONSTRUCTION PROJECTS

American Telephone & Telegraph Company, New York, contemplates a transatlantic radiogram and radio-phone broadcasting station near Bradley, Me., reported to cost in excess of $1,000,000. United Merchants & Manufacturers, Inc., Boston, Mass., plans textile finishing mill at Clearwater, S. C., to cost more than $1,000,000.

SOUTHEAST

—AS PURCHASING UNDER *new budgets gets under way increases in the size and number of orders are to be noted and general business this week is reported satisfactory.*

—INQUIRIES *are also on the increase and the outlook for the next few months is bright.*

A North Carolina power company ordered last week a waterwheel generator costing $30,000. Some good wire business is reported, a Georgia company ordering 82,000 lb. of bare and weatherproof copper, while an Alabama company ordered 70,000 lb. of the same material and a Carolina company placed an order for one carload of bare copper. An order is pending now in Georgia on control and varnish-cambric, lead-covered cable and this order will probably be let this week. One company's distribution and small power transformer orders last week totaled $6,900, while its meter purchases aggregated $5,200. Another order was for network protectors amounting to $5,300. Some other central station orders were for aluminum conductors amounting to $3,900, creosoted pine poles totaling $2,900 and switches totaling $2,400. Industrial buying is not keeping pace with the central station, though the general volume is reasonably satisfactory. The only industrial order of moment placed last week was by an oil company in Louisiana for power transformer equipment costing $65,000.

CONSTRUCTION PROJECTS

Ford Motor Company, Detroit, Mich., is reported planning extensions and improvements in assembling plant at Norfolk, Va., to cost more than $1,000,000. Winchester, Va., plans extensions in street-lighting system. South Carolina Power Company, Charleston, S. C., contemplates a steam-operated power plant at McClellanville, S. C. Mississippi Power Company, Gulfport, Miss., plans power substation at Walthal, Miss. Gulf States Steel Company, Gadsden, Ala., plans sheet mill to cost about $2,000,000.

PACIFIC COAST

—BUSINESS, BOTH POTENTIAL AND ACTUAL, *is excellent, jobbers especially reporting a good start for what is expected to be a good year.*

—IT IS CONSERVATIVELY ESTIMATED *that power company expenditures along the Pacific Coast during 1930-31 will total $200,000,000.*

—THERE IS MUCH *farm extension work all over California, which is reflected in excellent transformer business. Dealers report rather slow business and that many reorders for holdiay trade were carried over. Radio sales are fair and featured by bargains and leaders.*

An oil company's order for $25,000 worth of service station reflectors is awaiting advertising appropriation. Industrial business includes a 150-hp. General Electric motor, synchronous motor-generator set and starter for a Bay paper plant, a 500-hp. motor and controls for a Washington paper mill, a Westinghouse storage battery locomotive valued at $33,000 for an Arizona mining company, $30,000 worth of Westinghouse motors for a Portland lumber company, a $5,000 General Electric switchboard for a Seattle River lumber company and $1,500 worth of parkway cable for a Eureka lumber mill. U. S. Government business includes 5,000 lb. of friction tape, power cable for Mare Island navy yard and a $15,000,000 program for San Diego, of which $2,000,000 is to be spent immediately for erecting shops, hangars and barracks. Overseas business includes $8,000 worth of street lighting cable for the Hawaiian Islands and a carload each of copper wire and pole line hardware for Asia.

Ten thousand batteries were bought by a railroad. Power company business includes two carloads of bare wire valued at $18,000 and 400 butt-treated poles, largely 9 in. 50 ft., valued at $9,000, all for the Concord district, where much line extension work is being done.

Plans and specifications for a $2,000,000 25,000-kw. steam-generating plant to be built in Tacoma, augmenting that municipality's hydro-electric developments, are being completed and a call for bids for the turbo-generator and accessory apparatus is expected to be made within ten days. Designs for a power plant on the tide flats are now being prepared. The West Kootenay Power & Light Company, Victoria, B. C., has announced plans for early construction of the largest dam in Canada, 350 ft. high, at the junction of the Pend Oreille and Columbia Rivers, where ultimately 350,000 hp. will be developed.

Apparatus and motor sales reported include six 73-kv. oil circuit breakers, costing about $35,000, to the Puget Sound Power & Light Company for installation in its White River hydro plant, about $2,000 worth of miscellaneous central-station switchgear, and approximately $10,000 worth of soft-drawn solid copper wire, the latter to the city of Seattle. One jobber reported the sale of 30 motors from 100 hp. down to mills and industrials, another thirteen and nine machines from 100 hp. down to two sawmills in the Puget Sound district, another two pumping units with 20 hp. machines for eastern Washington irrigation and another twenty machines from 50 hp. down to scattered woodworking plants in Seattle and Tacoma. The city of Seattle is taking bids for 200,000 lb. of weatherproof copper wire, 60,000 lb. of 300,000-circ.mil copper and for 645,000-volt pin type insulators, also for one pumping unit complete with motor and control costing about $5,000. Bids for furnishing four high-speed elevators and motors for the $2,000,000 medical arts building in Tacoma are being taken by the A. W. Quist Company, Hoge Building, Seattle.

CONSTRUCTION PROJECTS

Feather River Power Company, San Francisco, Calif., plans addition to hydro-electric generating plant on Feather River, Plumas County, to cost $5,000,000. Pacific Gas & Electric Company, San Francisco, Calif., plans steam-operated electric power plant to cost $400,000. Los Angeles and Glendale, Calif., plan ornamental lighting systems. Puget Sound Power & Light Company, Seattle, Wash., will build a hydro-electric power plant on the Columbia River, near Wenatchee, Wash., to cost more than $10,000,000, with steel tower transmission line. Colorado Fuel & Iron Company, Denver, Colo., is planning expansion and improvement program at Minnequa plant at Pueblo, Colo., to cost over $1,000,000.

Copper Stocks Increase

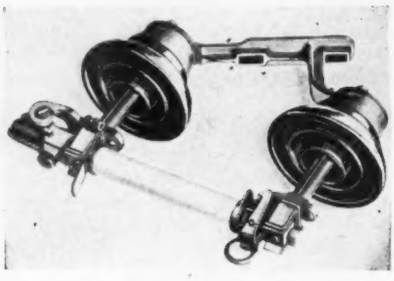
THE INCREASE in refined stocks of copper was generally discounted, so had no bearish effect on the market. Another sizable increase must be expected this month, though further curtailment is being made at the mines. A moderate tonnage of copper was sold in the week ending today, almost entirely for prompt shipment. The brass companies have obtained a few orders from the automotive industry, and the public utilities are placing a little wire business.

	Jan. 8, 1929 Cents per Pound	Jan. 15, 1930 Cents per Pound
Copper, electrolytic	18	18
Lead, Am. S. & R. price	6.25	6.25
Antimony	8¼ (spot)	8¼
Nickel, ingot	35	35
Zinc, spots	5.60	5.50
Tin, straits	39¼	38⅞
Aluminum, 99 per cent	24.30	24.30

New Equipment Available

Angle-Mounted Expulsion Fuse

A NEWLY DESIGNED expulsion fuse with angle mounting and having a maximum rating of 15,000 volts, 150 amp. continuous carrying capacity is announced by the Line Material Company, South



Milwaukee, Wis. The insulator is of the unit type, bolted on each end of the mounting, and is designated 17 M-15.

The contact clips are of high-grade copper with outer reinforcing phosphor bronze clips, designed to insure ample and uniformly distributed pressure. They are spaced on 12-in. centers. The top contacts are full floating and the lower contacts are fixed to cartridge variations. Mounting is of galvanized malleable iron, slotted for various size crossarms.

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Improved Power Factor Correction

A NEW DESIGN IN PERMITTORS which are capacitors employing gas under pressure as a cooling medium, and in combination with paper as the dielectric, is announced by the Products Protection Corporation, 75 West Street, New York, N. Y., and New Haven, Conn. The gas usually employed is carbon dioxide. A mixture of helium and nitrogen is also used in certain applications. These permittors provide for direct connection to voltages from 2,300 to 13,800 inclusive. They provide reliable economical power factor correction without fire hazards and with minimum space and weight requirements, the manufacturer claims. They are made in ratings of 30, 60, 90 and 120 kva., the latter being the highest kilovolt-ampere rating available in a single tank. Two or more tanks are grouped to form outfits of higher kilovolt-ampere ratings.

The permittor is made in sections so combined as to form a unit of desired voltage, frequency, phase and kilovolt-ampere rating. A permittor section consists of plates of aluminum foil spaced by uncalendered linen paper. The plates of like polarity are electrically connected by welds. The assembly of permittor sections is held in compression betweeen two steel castings by bolts. Impedance discharge coils which quickly dissipate the charge at the moment the permittor is disconnected from service are firmly fixed to the underside of the lower steel castings.

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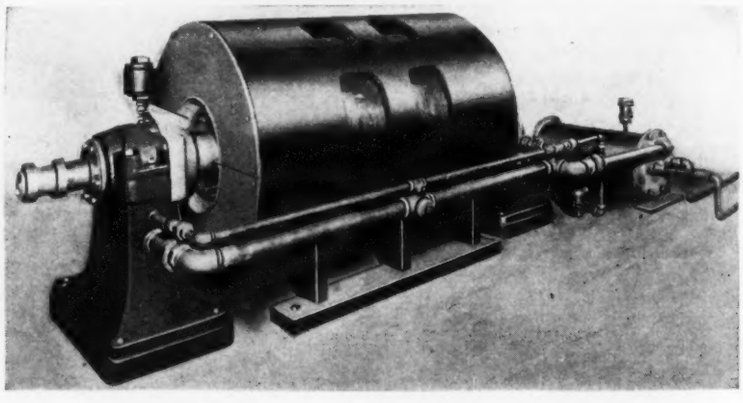
Gas Analyzer Uses Steel Wool Absorption

A RADICAL IMPROVEMENT has been made by the Hays Corporation of Michigan City, Ind., in its line of flue gas analyzers. The corporation has for some time been developing this new line and now announces six standard ranges in light-weight metal-carrying cases each weighing 8 lb. complete and also three special ranges available in slightly larger cases.



The special features claimed for this analyzer are light weight and compact design; heavy molded glass absorption pipettes which are attached to the molded hard rubber chemical bottles with soft rubber gaskets and finger compression nuts; steel wool surface method of absorption of the gases being analyzed, making it possible to take a CO_2 reading in 30 seconds and a complete analysis for CO_2, O_2 and CO in from four to five seconds; monel metal needle valves and easily renewable nickel needle valve seats; molded hard rubber chemical bottles held in place by slidable flat springs which can be raised after loosening the holding screw, permitting disassembly of the entire instrument for cleaning within two minutes' time.

The instrument can be carried in any position without liability of spilling or mixing the solution. The leveling bottle and the aspirator and tubing are clamped inside the case after completion of tests. When the doors are closed all accessories are inside the carrying case with the tubing so arranged on convenient reels that kinking is not possible.

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1,250-Hp., 3,600-R.p.M. Motors

ANSWERING THE NEED for high-speed motors capable of developing high horsepower, the Westinghouse Electric & Manufacturing Company has developed 3,600-r.p.m. induction motors with ratings of 500 hp. up through 1,250 hp. They have been built and are now in service, and if more power is required the line can readily be extended. These motors have high efficiency and power factor even at light loads, the manufacturer states, and the starting currents are low. The motors are small in size, the largest one built to date weighing only 7,700 lb.

One-piece punchings of silicon steel are used in both stator and rotor and the primary slots are the familiar open type, facilitating the removal and replacement of coils should this be necessary. The rotor is all metal and practically indestructible. It is carefully balanced dynamically. The bearings of these motors are pedestal type, split at the horizontal center line, making it possible to remove the bearing without dismantling the motor. They are lubricated by oil under pressure, supplied by a positive feed pump.